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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XX

WITH 49 PLATES

1932

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

SUBSCRIPTION PRICE:

ONE DOLLAR A YEAR SINGLE NUMBER TEN CENTS

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XX JANUARY, 1932 No. 1

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OF THE MISSOURI BOTANICAL GARDEN

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NYMPHAEA "ST. LOUIS"
("Mrs. G. H. Pring" x *N. Stuhlmannii*)

Missouri Botanical Garden Bulletin

Vol. XX JANUARY, 1932 No. 1

FORTY-THIRD ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the forty-third annual report of the Director:

In an address before the Missouri Historical Society on "Henry Shaw and his Garden" reference was made to the relation of Peter Collinson and Linnaeus to Mill Hill School, Mr. Shaw's *alma mater*. It was suggested that, contrary to the generally accepted idea that the Chatsworth garden, in Derbyshire, England, the estate of the Duke of Devonshire, furnished the inspiration for the Missouri Botanical Garden, unconsciously Henry Shaw as a boy of sixteen had fallen under the spell of Collinson's trees and garden and later in life, when he could afford it, made real this early dream. It must be admitted that there was no evidence for such a statement. It was simply another way of accounting for Mr. Shaw's love for plants, and particularly for his scientific interest in a subject which was as notable as it was unusual. Now comes corroboration in an unexpected way. The following quotations from an old book which has just been received at the Garden library would indicate that others had the same idea:

"While at school he (Henry Shaw) took a great interest in gardening, and, in after years, was wont to tell of the de-

light with which he used to gaze on the cedars and other famous trees, and to cultivate his own tiny plot." (page 49*).

"He used to trace his interest in botany to the sight of the Linnaean cedars at Mill Hill." (page 309*).

"He entered the school in 1815, and acquired there a taste for botany, which in after-life he used to trace to the magnificent trees he saw in the school grounds." (page 345*).

The authority for these statements is not given. Perhaps it is taken for granted that under the given conditions the effect could not have been otherwise. In any case, the thought that the influence of Linnaeus and Collinson manifested itself through Henry Shaw in the creating of a botanical garden in the new world is one which might very well be cherished. Certainly it emphasizes the fact that the Missouri Botanical Garden was founded as a scientific institution and not merely as a pleasant park for recreation. The bust of Linnaeus, flanked by those of Asa Gray and Nuttall, all botanists of the first rank, which Mr. Shaw had placed over the doorway of one of the greenhouses, gives additional evidence of this fact. Nor should be forgotten the little obelisk which stands at the entrance to the "Library and Museum" building, on which Mr. Shaw had cut the following inscription:

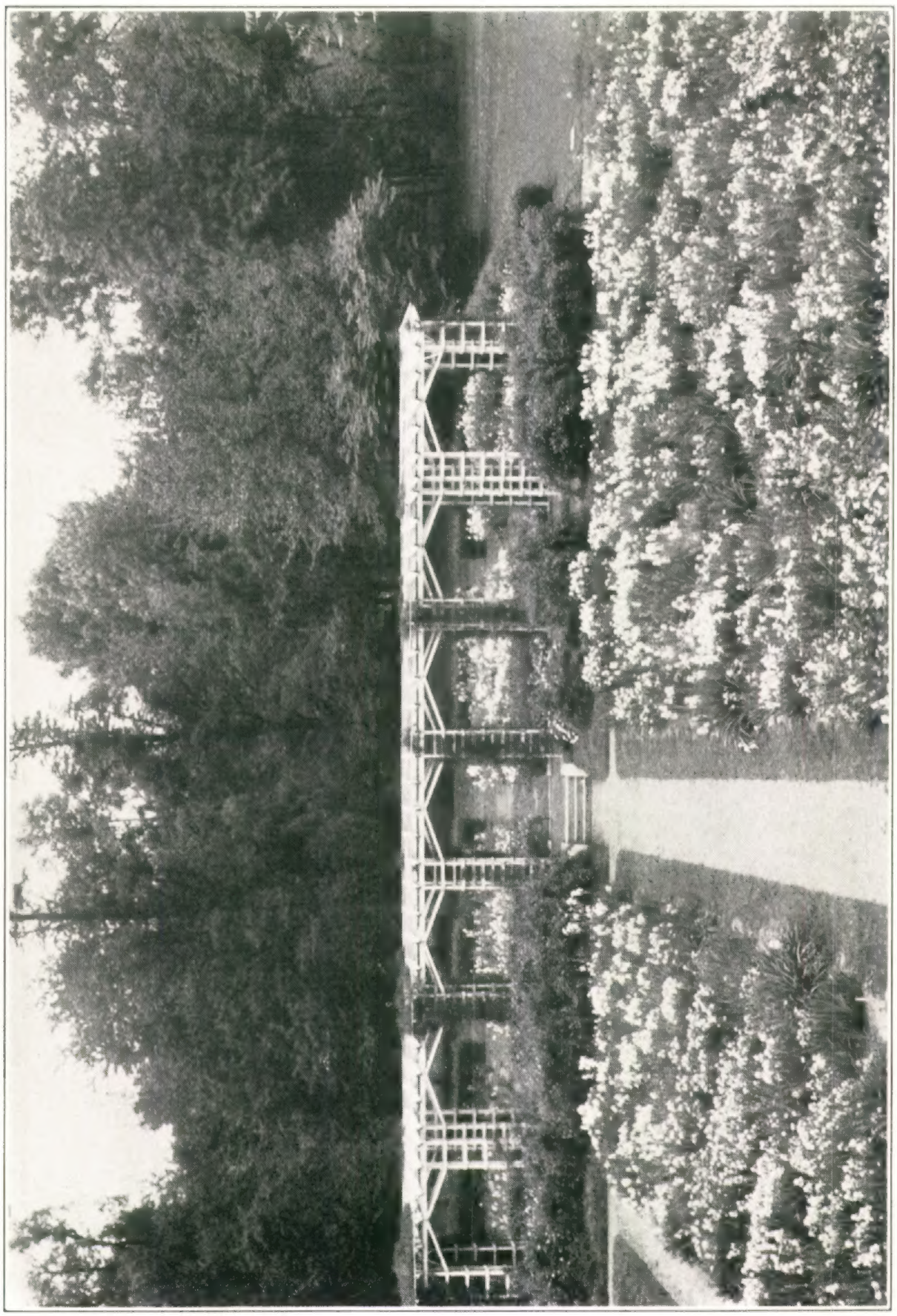
IN
HONOUR
OF
AMERICAN SCIENCE

TO THE MEMORY OF
THOMAS NUTTALL
BORN IN ENGLAND, 1786,
AND DIED SEPT., 1859.
HONOUR TO HIM THE ZEALOUS
AND SUCCESSFUL NATURALIST
THE FATHER OF WESTERN AMERICAN
BOTANY, THE WORTHY COMPEER OF
BARTON, MICHAUX, HOOKER,
TORREY, GRAY, AND
ENGELMANN

---

* James, Norman G. B., The history of Mill Hill School.

LOST YELLOW LILY (NYMPHAEA STUHLMANNII)
Photographed August, 1930



VIEW OF IRIS GARDEN

At some future time, when it is hoped the citizens of St. Louis will manifest in tangible form their appreciation of one of the city's greatest benefactors, instead of merely collecting taxes from his estate, perhaps the epitaph, spoken by Mark Antony and composed by one whom Mr. Shaw himself honored with a statue in Tower Grove Park, might well be incorporated in a memorial to Henry Shaw:*

"Moreover he hath left you all his walks,
His private arbors and new planted orchards, hath
left them you,
And to your heirs forever, common pleasures,
To walk abroad and recreate yourselves.
Here was a Caesar, when comes such another?"

In the forty-second report reference was made to the successful culmination of a long search for the "lost yellow lily," *Nymphaea Stuhlmannii.* The work of hybridizing this species with various other tropical lilies grown at the Garden is still incomplete. Additional crosses were made during this last season, and the progeny of the second generation is still to be obtained. One hybrid, however, has proved to be worthy of the name given it, namely, "St. Louis." This plant, the result of a cross between *N. Stuhlmannii* and *N.* "Mrs. George H. Pring," has produced blossoms of a pale yellow color far superior in size and shape to the original wild species. Moreover, it is a freer bloomer and much easier to propagate than *N. Stuhlmannii.* Thus the Garden was not only the first to cultivate the African yellow lily but likewise has produced the first hybrid of any value using *N. Stuhlmannii* as one of the parents. In *Nymphaea* "St. Louis" there has been created at the Garden another notable tropical lily worthy to take its place among the hybrid lilies previously originated here.

Early in the year Governor-General Dwight F. Davis offered to present to the Garden a collection of Philippine orchids. The necessary permit having been obtained from the Department of Agriculture, a shipment was made which reached the Garden in July. About 250 plants were received, many of which were new to the Garden collection

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* Julius Caesar. Act III, Scene ii.

and several so rare that they are owned by but few growers. The plants supplement most admirably the Philippine orchids already possessed by the Garden, and sincerest thanks are due Mr. Davis for the effort he made to secure this collection and for his generous gift.

Early in the year a request was received from the Council of the St. Louis Horticultural Society for the Garden to furnish it office facilities. This society, organized four years previously, had maintained an office downtown, but it was believed that it would be benefited by transferring to the Garden. It has always been the policy of the Garden to encourage the Horticultural Society in any way possible, and since the south room in the recently renovated museum building was not occupied, space in this room was loaned to the Society and the Secretary is now installed there. The spring flower show and the annual dahlia show, formerly held downtown, conducted under the auspices of this Society, were both staged in the floral display house at the Garden this year.

For the past four years there has been offered at the Garden a course for amateurs on various gardening subjects. From year to year the number registering for this course has gradually increased, but it was something of a surprise when more than 150 persons desired to take the course in 1931. This evidence of the awakening of interest in gardening in St. Louis makes it desirable that, in so far as possible, increasing opportunities be afforded for instruction along gardening lines at the Missouri Botanical Garden.

The PROCEEDINGS OF THE CELEBRATION OF THE THREE HUNDREDTH ANNIVERSARY OF THE FIRST RECOGNIZED USE OF CINCHONA, held in 1930, were published in March of this year. That the papers presented on this occasion were well worth printing is perhaps best indicated by the following quotation from a review of the Proceedings, written by Professor H. H. Rusby, which appeared in the November number of the "Journal of the American Pharmaceutical Association":

"This is a botanical work of a very unusual character and of a high order. To bring together in one volume a sum-

BLUE SALVIA AND PINK ZINNIAS IN LINNAEAN GARDEN

SUMMER BEDDING PLANTS IN MAIN GARDEN

CHRYSANTHEMUM SHOW, 1931, LOOKING TOWARD BALCONY

mary of the taxonomic labors of so many eminent botanists as have written on cinchona, including extensive field observations as well as herbarium studies, to follow with a detailed history of the behavior of plants under cultivation in foreign countries, to discuss the pharmacognosy of their products, their chemical constituents and the variation of these in the several species and under varying treatment, their relation to human disease and their economic history was an undertaking as wisely conceived as it has been successfully executed. The result of this series of contributions is to supply a volume of monumental importance, and one that will serve as a storehouse of information for all time."

Mention should be made of the valuable contributions both to the herbarium and the collection of living plants made by Dr. Kerbosch, of Java, and Mr. Besant, of the Glasgow Botanic Garden. These gentlemen, who were in attendance at the cinchona celebration, made careful notes while here of material they would be able to supply. Upon their return home they were untiring in their efforts to secure and forward to the Garden valuable specimens which could not have been obtained otherwise.

On December 27 the Garden kept "open house" to botanists on their way to attend the meetings of the American Association for the Advancement of Science at New Orleans. Guides were available to conduct visitors through the grounds and greenhouses, and the library and herbarium were open to those who wished to avail themselves of the opportunity of examining books and specimens. The occasion was made notable by the celebration of the one-hundredth anniversary of the birth of Julius Sachs, the famous German plant physiologist. After luncheon, served in the administration building, the party adjourned to the museum auditorium, where the following program was presented:

"Plant Physiology as Sachs Found It" . . . . . .
Dr. Ernest S. Reynolds, Washington University

"The Contributions of Sachs to Plant Physiology" . . .
Dr. Charles F. Hottes, University of Illinois

"Progress in Plant Physiology since Sachs" . . . . . .
Dr. D. T. MacDougal, Carnegie Institution

These papers will appear in a forthcoming number of the ANNALS.

Perhaps no better evidence of the standing of the Missouri Botanical Garden in the scientific and amateur world can be found than in the notice given it in newspapers, magazines, and similar publications. Aside from the local press, which has always been most generous in the publicity given the Garden, hardly a week goes by without receiving clippings from newspapers in various parts of the country calling attention to some aspect of the work being conducted here. The BULLETIN articles are largely reprinted, and special occasions, such as the celebration of the tercentenary of the first recognized use of cinchona and the one-hundredth anniversary of the birth of Julius Sachs, received lengthy notice. Below are listed some of the better-known magazines which, during 1931, have published reprints from the BULLETIN or given more than a passing reference to the Garden. The range of subjects covered is best indicated by the character of the periodical cited.

International Medical Age	**Orchid Review**
Florists' Review	**Horticulture Illustrated**
Merck's Report	**Science News Letter**
Park and Cemetery	**Southern Florist**
Flower Grower	**Journal of American Pharmaceutical Association**
Florists' Exchange	**Garden Club Exchange**
Literary Digest	**Science**
Tropical Life	**Horticulture**
School and Community	

European Representative.—Mr. Gurney Wilson, F.L.S., Editor of the "Orchid Review" and European representative of the Garden, has been most successful during the past year in obtaining long-desired books and pamphlets for the library, as well as seeds and other material for the Garden. His activity in securing old seed catalogues is rapidly placing the Garden library ahead of any other in the country in this particular field. It might not be supposed that these old catalogues would be of any value, but they frequently contain information as to the origin or history of a plant which cannot be found elsewhere. Of particular interest was a complete set of Veitch's catalogues, including the general cat-

VIEW OF 1931 CHRYSANTHEMUM SHOW FROM BALCONY

CASCADE CHRYSANTHEMUMS
1931 DISPLAY

alogue for 1873 and 1874, containing valuable notations. There was also a copy of Peter Lawson & Sons' "List of Seeds and Plants" for 1855.

Indoor Floral Display.—The three new propagating houses for the city Garden, begun in 1930, were completed, as well as the addition of three growing houses to the orchid range at Gray Summit. Two additional tanks to take care of the increasing number of water-lily seedlings were built in the propagating range. An artistic fountain was installed in the pool at the south end of the floral display house which greatly increases the attractiveness of the approach to the flower shows.

Something quite new at the Garden was the erection of a wire fence bordering the walk in the succulent house. Smaller cacti and other succulents were disappearing so rapidly from this range that this protection was given in the hope that it would dissuade visitors from appropriating these plants. Unfortunately, this method was not successful, and it became necessary later in the year to close the house, opening it only on special occasions or to enable those particularly interested in the collection to view it.

The reputation of the Garden for staging attractive displays of blooming plants throughout the fall, winter, and spring months has become so well established that not only are the shows attended by visitors from St. Louis and immediate vicinity, but many now motor long distances in order to see them. While the material used is necessarily much the same from year to year, an effort is made to vary the arrangement as much as possible, and of recent years the accessories and settings of the shows have proved to be as important as the plants themselves.

Early in January the Christmas poinsettia show was removed and by the middle of the month the orchids were on display. Because of the inclusion of the seedling exhibit which was shown at Washington, D. C., the previous autumn, and certain other special features, all previous records for attendance were broken. With the exception of the chrysanthemums, the orchid show has come to be the most popular indoor floral display at the Garden. In March

three separate shows were staged: the first consisting of tulips, hyacinths, and other spring flowers. This gave place to the annual show of the St. Louis Flower Show Association, in many respects the best exhibition ever attempted by the Association. Not only the quantity and variety, but the quality of the cut flowers was superior to any previous show and reflected great credit on the local growers. The cup offered by the Garden was finally won by Joseph Witek, he having received the highest number of points at three of the Association's shows. That the public appreciated the efforts of the florists was manifested by the attendance, over 20,000 coming to the Garden on Sunday, March 21, the last day of the show. In this connection, the following letter from the Secretary of the Association indicates the appreciation of the St. Louis florists of the privilege of having the facilities of the Garden always at their disposal, and the cordial relationship existing between the growers and the Garden:

> **"The St. Louis Flower Show Association and the St. Louis Florists' Club wish to take this opportunity to express our gratitude to the Missouri Botanical Garden for the sincere cooperation given us in the recent flower show held at the Garden. We consider ourselves extremely fortunate above the florists of other cities in having such an ideal place in which to give our shows. There is constantly growing a closer relationship between the Garden and the florists of this city, which is as it should be. May we hope for the continuous growth in popularity of these flower shows and for your continued good will and coöperation which make it a pleasure to those exhibiting."**

Immediately following the Association's flower show a fine display of azaleas and cinerarias was installed. The floral display for April was unusually attractive, consisting of rare color combinations achieved by a mixture of blooming plants forced for the purpose. Three distinct floral displays were staged during May and the early part of June, with the St. Louis Horticultural Society holding its show at the Garden the last of May. During the summer the permanent showing of fancy-leaved caladiums was made in the floral display house. This was not removed until the installation of the chrysanthemums in November. This show still attracts the greatest number of visitors. With the aid of

hanging baskets and cascade chrysanthemums, stone lanterns, tori gates, and other special features, all combined in a Japanese setting, it was one of the most pleasing arrangements that has been devised. The chrysanthemums were followed by the regular Christmas display of poinsettia, narcissus, etc.

Outdoor Planting—Display Gardens.—One of the finest collections of tulips ever shown at the Garden, brought to St. Louis through the efforts of the Holland Bulb Exporters' Association of Haarlem, afforded the visitor an opportunity of seeing some of the newest plants in all of the different classes. As favorable weather conditions prevailed during late April and early May, the tulip season extended over a long period and gradually merged into the season of the iris, the next important flower to claim the attention of the visiting public. Most of the clumps in the American Iris Society test garden, which is maintained at the Garden, have reached their maximum size and each clump carried many stalks of flowers. While there are more than one thousand varieties in this collection, many of them are so similar or can no longer be obtained from the iris specialists that it seems desirable in future plantings of this sort that the American Iris Society's 1931 "Discard List" should be closely followed.

As the winter was very mild, the climbing roses lost practically no wood and the display was unusually good. Varieties that are partly frozen in some winters bloomed as profusely as the hardier sorts. Unusually good varieties noted were "Star of Persia," "Albertine," "Jacotte," "Mary Wallace," "Roserie," "Silver Moon," and "Aviateur Bleriot." Contrary to expectations after a mild winter, the bush roses were not as good as the climbers. As a considerable portion of the rose garden is devoted to hybrid perpetuals and most of the beds were remade, many of these roses had to be reset. This checked their growth to some extent, and the apparent ravages of the brown canker disease also reduced the number of flowers considerably.

The spring display of flowers in the Linnaean garden was composed of hyacinths, tulips, and irises. The hyacinth and

tulip borders surrounding the groups of irises were planted with various annuals. The new pink zinnia "Exquisite," planted against *Salvia farinacea*, was one of the pleasing color combinations. Another good effect was produced with this same "Mealycup Sage" by planting it between a large number of gladioli of the variety "Alice Tiplady." For a misty blue color effect in the garden and continuous bloom during the summer, there is nothing to equal this blue salvia. The Lilliput zinnias, which have become so popular in the last two years, are to be recommended for their charm and brilliant colors.

The Italian garden contained its usual display of bedding and flowering plants surrounded by the closely cropped California privet hedge.

The main garden was planted with a number of varieties of Darwin tulips, followed by the summer bedding plants. The circular beds contained bronze castor beans, and the rectangular beds pink petunias, blue ageratum, and point plants of standard *Lantana delicatissima*. The summer bedding plants were removed during the last week in September and replaced with varieties of hardy chrysanthemums which had been grown in the field for that purpose. The best varieties in this planting were "September Queen" (white), "Normandie" (white), "Yellow Normandie," and "Glada" (pink). All of these bloomed before the middle of October, a point to be remembered in selecting varieties that can be relied upon to bloom before severe frosts blacken them.

The knolls were attractive at different periods during the spring and summer when the various groups of plants came into bloom. Some years ago these knolls were planted with large groups of native plants, but as these have served their purpose they are gradually being replaced with groups of herbaceous perennials and annuals to extend the period of bloom over the entire season.

Outdoor Planting—Trees and Shrubs.—The fertilizing experiments on trees, begun in 1928, were continued despite the abnormally dry year. The lack of moisture seriously interfered with these tests, making measurements of little

value. However, the dry season has shown that the feeding of trees can be made to take the place to some extent of an adequate water supply, judging by the rate of growth. The walnut orchard, which was fertilized for the third consecutive year with a crop of weeds plowed under in spring and fall, distinctly manifested the effects of fertilizers. The average twig growth was over 14 inches, while the leaves were retained until a light freeze in November.

In the fall of 1930 no moisture was observable in the soil to a depth of 13 feet. The winter and spring rains of 1931 reached a depth of only 42 inches, and this was quickly used by grass, shrubs, and trees. Many trees consequently suffered greatly, shedding leaves all summer long, except when fertilized. In July an effort was made to measure the efficiency of watering trees with a hose and sprinkler. Under a large maple, in a 40-foot circle, water was left running for seven days and nights, delivering in this time 5,500 gallons of water. Fully 50 per cent evaporated, but the remaining water moistened the soil to a depth of 49 inches. This was sufficient for trees in this locality. The method, despite the great waste, would be satisfactory if the water were left running continuously for a week or more.

It was necessary to use 750 gallons of arsenate of lead spray to control leaf-feeding insects. An additional 1,400 gallons of contact spray were used outside, and 225 gallons in the display house. This is the first attempt to use the power sprayer indoors. Delayed dormant spraying of trees and shrubs required 3,550 gallons of oil spray.

Nearly six months' time was devoted to the pruning of trees and large shrubs in the Garden proper. A few cables were installed. Only one tree received cavity work. This, a small maple at the main gate, showed callus forming five days after the completion of the operation. Rather extensive experiments are now under way, which it is hoped will shed some light on two much-disputed subjects—the time of pruning and type of wound dressing.

Propagation of the choicer varieties of trees and shrubs was begun in January. About 3,000 cuttings were made. When rooted some of these were sent to the Gray Summit

nursery and a few were kept in St. Louis. A total of 1,285 trees and shrubs (68 varieties), many of them new to St. Louis, were brought in from Gray Summit. A "specimen" garden for the growing of newer introductions was set aside in the north half of the economic garden. The area west of the palm house and extending along Alfred Avenue was planted to a variety of trees, this section having been previously plowed for the purpose. A number of "weed" trees (willow and cottonwood) were removed to make room for these new plants.

Many new drains were laid and broken catch-basins replaced. A new cold-process asphalt was used for patching roadways and for the installation of a new four-foot walk at the south end of the economic garden as well as the resurfacing of a walk in the Linnaean garden. An old spray pump was used for the purpose, which handled 350 gallons during the season with comparative ease.

Mushroom soil was placed over all lawns in the main garden, with the result that they remained green except for a short period during the entire summer. About 22,300 square feet of bent grass sod was used in the Garden, most of it around the lily pools. The same area was rebroadcast with bent stolons in the nursery. The occasion for this unusual amount of sodding was the appearance of a brand-new pest related to the June bug larvae. The rapid browning of the bent grass was at first ascribed to drought. When repeated waterings failed to revive it, investigation showed that the larvae of a beetle were present by the thousands in the soil and had eaten off the roots of the grass so completely that it died. This same pest appeared in a few of the beds in the Italian garden, but the greatest damage was to the bent grass lawn between the main gate and the palm house. While it is believed that methods have been devised which will prevent the appearance of the larvae in the future, it is impossible to say how successful these have been until another season has passed.

ATTENDANCE FOR THE YEAR 1931

(Recording turnstile count)

	Week-days	Sundays
January	15,054	12,334
February	9,508	13,777
March	13,599	28,958
April	17,330	16,542
May	20,705	28,416
June	17,538	9,674
July	17,607	8,915
August	24,691	13,816
September	16,914	13,713
October	26,934	13,665
November	26,638	31,386
December	9,077	9,788
	215,595	200,984
		215,595
Total		416,579

Gray Summit Extension.—The completion of three additional greenhouses begun in 1930 has made it possible to segregate the orchids, greatly to the advantage of cool-loving plants. The passageway at the head of this range has been fitted up as a display house, and the blooming plants are accumulated here prior to being brought into the city. As a consequence, there is now maintained at Gray Summit an orchid display which at times rivals the one in town. During the past year there have bloomed at Gray Summit nearly 10,000 orchid plants, all of which have been displayed either at Gray Summit or in the city.

Four years ago, when the Garden began on an extensive scale the growing of orchids from seed, it was not contemplated that this particular project be continued indefinitely. Because of the unexpected quantity of desirable seed which was obtained and the success of Mrs. Linder, the Orchidologist, in propagating plants from these, it was decided to terminate the work this year. An institution such as the Garden is not justified in accumulating in great quantity seedlings which in the course of a comparatively few years would produce plants far beyond the facilities to accommodate them. As the result of this work there are now housed

at the Gray Summit Extension over 20,000 orchid seedlings ranging from one to four years of age. Nearly three hundred different hybrids are included, covering a wide range of genera, some of which are entirely new combinations. Seedlings potted during the year number 6,500.

The valley between the cherry and crabapple orchards has been graded and is now ready for surfacing of a 25-foot roadway. The area set aside for the planting of exotics has been graded and seeded and the slopes and road gutters in the same section sodded. Necessary culverts and catch-basins have been built, and the bridge south of the lake in the pinetum, as well as the one over Brush Creek, has been entirely reconstructed.

The growing of rare trees and shrubs from seed has continued. Nearly 5,000 young trees were shifted from seedbeds into nursery rows, and thousands of large trees and shrubs have been transplanted from the nurseries to their permanent location.

General improvements have consisted in the removal of the old barn near the administration building, as well as the house near the southern boundary of the tract. About two miles of additional trails have been cleared and many miles of old wire fence removed. The unprecedented dry seasons experienced for the past two years not only caused the 150,000-gallon cistern to be exhausted but likewise the water level in the well was drawn down from 65 feet to 25 feet. This condition would have caused some alarm had it not been for the artificial lake in close proximity to the growing houses. An emergency pump was installed on the shore of the lake and 1,000 feet of 2½-inch pipe were laid to connect the lake to the cistern. This arrangement made it possible to continue to supply the plants under glass with an abundance of rain water.

For the past several years sunshine records have been kept by duplicate machines at Gray Summit and the city garden, and the number of hours that the sun shone at these two localities is listed below. It is interesting to note that at the time of year when the sunshine is most necessary and valuable for plant growth—October, November, December.

and January—the number of hours of bright sunlight at Gray Summit exceeded that in town by 83 hours, a difference which in itself would account for more vigorous growth, quite apart from the more favorable atmosphere in which the plants at Gray Summit live.

HOURS OF SUNSHINE RECORDED IN 1931

Month	St. Louis	Gray Summit
January	132¾	152¼
February	120¼	121
March	125	130¼
April	215	213½
May	222	231
June	264½	296½
July	287¼	282½
August	270½	273½
September	247	255
October	168	184½
November	126	137½
December	83	117½
	2,261¼	2,395¼
		2,261¼
Difference		134

Tropical Station, Balboa, Canal Zone.—Extracts from the report of the Resident Manager of the Tropical Station give an idea of the development and activities of this important adjunct of the Garden:

"The work at the Station has been carried on as in previous years, consisting mostly in the collection of new material and trying to find the most satisfactory methods of treatment in order that the new plants may adapt themselves to the conditions found in the Garden.

"The information gained in the past has been taken advantage of and wherever satisfactory results have been secured the method has been continued. The changed conditions at the Station give opportunity for a large number of experiments which may eventually make the transplanting of the plants less difficult and surer.

"Various kinds of native woods have been tried as supports for the plants to determine which are best suited for

the purpose. Nothing has been found that is entirely satisfactory. Most of the woods have been too short-lived. Plants placed on them require changing to new supports just as they begin to adapt themselves and are set back with the usual stunting, or lost entirely. Cork bark was used and found to be very good during the wet season, but as soon as the dry season set in the plants died. Three varieties of wood have been selected as the most satisfactory, Espave, Spondias, and Calabash. All are more or less easy to secure and wherever possible they will be used in the future.

"For the most part baskets and pans with peat packing have been found to be the easiest and best means of caring for the small- and medium-sized plants.

"Insects, as usual, have caused considerable annoyance and damage, but by the plentiful use of soap and nicotine the damage has been reduced. A gray-colored grub, about one inch long at maturity, has been particularly troublesome. This pest in the early stage of its existence feeds on the young roots in the peat and cannot be detected until it has done some damage. It is hard to kill, does not mind soap, nicotine or bichloride solution weak enough not to kill the plants. Digging out and repacking the plants has been found the only means of getting rid of the grub.

"The extermination of termites which cause considerable damage to all woodwork has been found to be an easy matter. At first calomel was used and proved very effective, but later it was discarded on account of the price and the difficulty in placing it where the termites would come in contact with it. Now any of the salts of arsenic of the usual commercial form are used. These are easily handled and distributed with a dust gun and are possibly more effective than calomel.

"Three new-style racks for supporting the plants have been erected. These are made of 2½-inch galvanized pipe, set in concrete, with iron rods on which to hang the plants. Shade as desired made of narrow strips is placed over the rods. One rack, 10 by 70 feet, was placed over the drain in the upper part of the Station, using space that could not be utilized otherwise. The others, 10 by 20 feet, are under

trees at either end of the garden. So far these have proved very satisfactory, and I am sure will be a great deal better than the old stands. It is easier to regulate the shade to the desired amount, and they can be protected from the wind, besides lasting indefinitely.

"The slat house is getting old and showing signs of weakening, and it is planned to replace it with pipe and iron during the coming dry season.

"In June, Mr. Bouché, who has been my companion on a number of trips, planned to go to San Jose, Costa Rica, and work back across the country to the Volcan section of the province of Chiriqui, Panama. In San Jose he learned that the rains had started so violently that it would be impossible for him to carry out his original plan. He then returned to Port Limon and collected extensively in the country back of there. He brought out a considerable number of plants, among which were *Cattleya Dowiana* and an unknown Cattleya. None of the plants collected by him have flowered yet, probably due to the time they were collected, but it is expected that they will flower during the coming season and will then be ready for identification.

"Mr. Bouché reports that he found *C. Dowiana* rather common but difficult to secure, as it grew almost invariably in the tops of very tall trees. This is of interest, as it has been understood that this orchid was almost extinct.

"One trip made by Mr. Bouché and myself was up into the valley of the Trinidad River. This is one of the largest rivers that flow into Gatun Lake from the West. We crossed the lake by launch to a point where the growth of water hyacinths made this mode of navigation impossible, then proceeded by cayuco. The hyacinths were in full flower, and in passing through the narrow channel between the masses we witnessed a display of colors that rivaled the rainbow.

"Along this river we found a number of the plants which were collected by Mr. Powell in the lake area during the rising of the water. Among these were *Chondrorhyncha Lipscombiae, Catasetum Warscewiczii, Oncidium Powellii,* and *Rodriguezia secunda.* We secured a fine plant of an Epi-

dendrum which is thought to be *E. raniferum,* a new one for Panama.

"Also a plant resembling in some respects Acineta, of immense size. This plant has not yet flowered. We plan to make another trip to this section during the coming season, when more time can be spent there.

"Several trips have been made to the section known as the 'Valley' in Coclé Province, about eighty miles from Panama City. A large number of species previously reported only from Chiriqui Province have been found there, besides new plants not yet identified.

"All of the collecting trips have been more or less spasmodic, and it has not been possible to cover thoroughly any large section. It is hoped that what has been learned will serve as the basis for further explorations and help to extend future ones into territories which have not yet been touched. There is so much of the country that has never had a collector in it that it will take years of work before we know what is to be found there. I can only hope to make a start and possibly make it a little easier for some one in the future.

"During the past two years particular attention has been paid to the elevation and exposure of the regions in which native plants were growing. The greater number of orchids have been found at fifteen hundred to four thousand feet elevation and on the north and east exposures of the hills. In fact so few plants are found on the other exposures that it is a waste of time to look for them there. This being the case, the Atlantic side of the country, which has scarcely been touched, will doubtless, when it is explored, yield many plants not yet reported for Central America.

"A number of different plants of economic value have been newly introduced at the Station. More will be grown as seeds or plants are available. The average visitor takes a great deal of interest when shown plants from which ordinary articles of commerce are obtained."

Annual Bequests.—The annual flower sermon "to commemorate the goodness of God as revealed in flowers," provided for in the will of Henry Shaw, was preached at Christ

Church Cathedral, on May 10. The Rev. Beverley D. Tucker, Jr., D.D., of Richmond, Virginia, officiated.

The Trustees' Banquet Fund, inaugurated under the will of Mr. Shaw, was drawn upon for the entertainment of visiting botanists on the occasion of the Julius Sachs celebration, December 27.

As in the past, the Gardeners' Banquet Fund has been used to provide a turkey at Christmas time for each of the various employes of the Garden.

The fund provided by Mr. Shaw for prizes at flower shows was expended for prizes given at the show of the St. Louis Flower Show Association and for the show of the St. Louis Horticultural Society.

RESEARCH AND INSTRUCTION

The following resignations took effect in October: Dr. Edgar Anderson, Geneticist to the Garden and Associate Professor of Botany in Washington University, who accepted a position at the Arnold Arboretum, Harvard University; Dr. David H. Linder, Mycologist to the Garden and Assistant Professor in Washington University, who accepted a position at Harvard University; Mr. Anton Hogstad, Pharmacognosist to the Garden, who resigned to take a position with Merck & Company. The vacancy created by Dr. Anderson's resignation has not been filled. Dr. Carroll W. Dodge, formerly Curator of the Farlow Herbarium and Library, and a Professor in Harvard University, was appointed Mycologist to the Garden and Professor of Botany in Washington University. Dr. Adele L. Grant, who was appointed Acting Curator of the Herbarium and Assistant Professor in the Henry Shaw School of Botany in the absence of the Curator, remained in residence for the first half of the year.

Dr. J. M. Greenman, Curator of the Herbarium and Professor in the Henry Shaw School of Botany of Washington University, returned to St. Louis on January 19, 1931, after a six months' leave of absence, and immediately resumed his regular curatorial duties and class work. The entire period of his leave was spent in Europe, and during this time research work on the Senecioneae, a tribe of the large

family Compositae, was pursued at several of the great European institutions, including the herbaria at the British Museum of Natural History in London, the Royal Botanic Gardens at Kew, England, the Botanical Garden and Museum in Berlin, the Museum of Natural History in Vienna, the Botanical Garden and Museum in Munich, and the Conservatoire et Jardin Botanique in Geneva. Important results were obtained from these studies which will be incorporated in the continuation of "A Monograph of the North and Central American Species of the Genus Senecio," additional parts of which will be published in the near future. Meanwhile preparations for a "Flora of the Southwest" and for "Studies of South American Senecios—II" have continued. One short article on "Compositae—A New Genus" has been published in Gleason, Botanical Results of the Tyler-Duida Expedition. Bull. Torr. Bot. Club **58**: 486-487, *pls. 39, fig. 1; 40, figs. A-K*. 1931. Dr. Greenman also has continued to direct the research work of graduate students majoring in taxonomy.

Dr. E. S. Reynolds, Physiologist to the Garden and Associate Professor in the Henry Shaw School of Botany of Washington University, has continued the investigation of substances in the juices of plants, toxic to fungi, in an effort to determine the range of such toxicity in the seed plants. The study of tree temperatures has been continued. He has supervised the introductory course in general botany, and given the introductory and graduate course in plant physiology, as well as directed the research of graduate students in this field. A paper, "Studies in the Physiology of Plant Disease," appeared in Ann. Mo. Bot. Gard. **18**: 57-95. 1931.

Dr. Robert E. Woodson, Jr., Research Assistant to the Garden and Instructor in the Henry Shaw School of Botany of Washington University, besides conducting courses in the University, has been engaged in an investigation of the taxonomy and morphology of the Apocynaceae, paying particular attention to the sub-family Echitoideae indigenous to the Western Hemisphere. Published accounts of research appearing during the year are: New or Otherwise Noteworthy Apocynaceae of Tropical America. Ann. Mo. Bot. Gard. **18**:

541-556; New South American Asclepiadaceae, *loc. cit.* 557-563; "Apocynaceae" in Gleason, Botanical Results of the Tyler-Duida Expedition. Bull. Torr. Bot. Club **58**: 452-454, *pl. 37*. 1931.

Dr. Roland V. LaGarde, Research Assistant to the Garden, was appointed an Instructor in Botany in the Henry Shaw School of Botany of Washington University. He has offered a new course in the biochemistry and microchemistry of plants, besides giving the lectures in the course on general bacteriology.

The spring course in gardening for amateurs was given from March 3 to May 26, inclusive. The major portion of the lectures was given by Mr. Paul A. Kohl, Floriculturist to the Garden, assisted by Mr. George H. Pring, Superintendent, and Mr. A. P. Beilmann, in charge of trees and shrubs. It was necessary to limit the number in this course to 150, since more applied for registration than could be accommodated.

The system of appointing three apprentices each year and requiring them to remain for three years has been continued. This arrangement results in restricting the number to nine, the maximum number that can be accommodated, three completing the work each year.

Miss Katherine L. Perkins, who had been in charge of the course in gardening given to the students in the School of Occupational Therapy, resigned in June, and with the beginning of the work in the fall Miss Edith Mason assumed charge of the course.

Graduates and Fellows.—The following appointments were made in the Henry Shaw School of Botany for the year 1931-1932:

Instructor in Botany: Harry J. Fuller, A.B., M.S., Washington University (half-time graduate student) (Plant Physiology and Mycology).

Assistants in Botany (half-time graduate students): J. C. Moore, B.S., Alabama Polytechnic Institute, Auburn, Alabama (Plant Physiology); Mary Elizabeth Pinkerton, B.S., University of Nebraska (Taxonomy); F. Lyle Wynd, B.S.,

M.A., University of Oregon (Plant Physiology and Taxonomy).

Rufus J. Lackland Research Fellowships: George J. Goodman, A.B., University of Wyoming, M.S., Washington University (Taxonomy and Morphology); John Adam Moore, B.S., Butler University, M.S., State College of Washington (Morphology and Taxonomy); Morris Moore, B.S., Boston University, M.A., Harvard University (Mycology and Physiology); Lily M. Perry, B.A., Acadia University, A.M., Radcliffe College (Taxonomy and Morphology).

Jessie R. Barr Fellowship: Dorothy Megowen Berkley, A.B., University of Illinois (Plant Physiology).

Fellowship in American Creosoting Company: Earl E. Berkley, A.B., University of West Virginia, M.S., Washington University (Plant Physiology and Chemistry).

Special Garden Fellowships: Caroline K. Allen, A.B., Vassar College, M.S., Washington University (Taxonomy and Morphology); Josephine Darlington, A.B., B.S. in Forestry, University of Montana, M.S., Washington University (Taxonomy and Morphology).

Independent Students: Ruth Cornelius, A.B., Washington University (Taxonomy and Morphology); Mary Ledgerwood Fuller, A.B., Harris Teachers College (Plant Physiology).

Degrees.—The following graduate students in the Henry Shaw School of Botany received advanced degrees at the Washington University commencement, June 10, 1931:

Doctors of Philosophy: Martha L. Beardsley, A.B., M.S., Washington University (Cytology, Plant Physiology, and Mycology); Alexander F. Bucholtz, B.S., Cornell University, M.S., Washington University (Plant Physiology); Charles Leo Hitchcock, A.B., A.M., Pomona College (Taxonomy and Morphology); Paul Franklin Shope, B.S., Pennsylvania State College, M.S., University of Colorado (Mycology and Morphology).

Published Articles.—

Anderson, Edgar. The Chromosome Complements of *Allium stellatum* and *Nothoscordum bivalve*. Ann. Mo. Bot. Gard. **18**: 465-468. 1931.

Anderson, Edgar. Internal Factors Affecting Discontinuity between Species. Am. Nat. **65**: 144-148. 1931.

Anderson, Edgar, and Dorothea de Winton. The Genetic Analysis of an Unusual Relationship between Self-Sterility and Self-Fertility in Nicotiana. Ann. Mo. Bot. Gard. **18**: 97-116. 1931.

Anderson, Edgar, and Brenhilda Schafer. Species Hybrids in Aquilegia. Ann. Bot. **45**: 636-646. 1931.

Beardsley, Martha L. The Cytology of *Funaria flavicans* Michx. with Special Reference to Fertilization. Ann. Mo. Bot. Gard. **18**: 509-540. 1931.

Berkley, Earl E. Marcescent Leaves of Certain Species of Quercus. Bot. Gaz. **92**: 85-93. 1931.

Berkley, Earl E. Studies of the Effects of Different Lengths of Day, with Variations in Temperature, on Vegetative Growth and Reproduction in Cotton. Ann. Mo. Bot. Gard. **18**: 573-604. 1931.

Bucholtz, Alexander F. The Effect of Monochromatic Ultra-Violet Light of Measured Intensities on Behavior of Plant Cells. Ann. Mo. Bot. Gard. **18**: 489-508. 1931.

Burt, Edward Angus. Hymenomycetous Fungi of Siberia and Eastern Asia—mostly of Wood-destroying Species. Ann. Mo. Bot. Gard. **18**: 469-487. 1931.

Card, Hamilton H. A Revision of the Genus Frasera. Ann. Mo. Bot. Gard. **18**: 245-282. 1931.

Dodge, Carroll W. Alpova—A New Genus of Rhizopogonaceae, with Further Notes on Leucogaster and Arcangeliella. Ann. Mo. Bot. Gard. **18**: 457-464. 1931.

Fuller, Harry J. Stimulatory Effects of Radiation from a Quartz Mercury Vapor Arc upon Higher Plants. Ann. Mo. Bot. Gard. **18**: 17-40. 1931.

Goodman, George J. Notes on the Distribution of Some Rocky Mountain Plants. Ann. Mo. Bot. Gard. **18**: 283-286. 1931.

Greenman, Jesse More. Compositae—A New Genus. In Gleason, Botanical Results of the Tyler-Duida Expedition. Torrey Bot. Club. Bull. **58**: 486-487. 1931.

Hogstad, Anton. The Three-hundredth Anniversary of the First Recognized Use of Cinchona. Proc. 300th Anniversary First Recognized Use of Cinchona. pp. 1-24. 1931.

Jensen, L. P. The Relation of Highways to State Conservation. Missouri Magazine, Vol. 3, No. 11. 1931.

Linder, David H. The Genus Helicoceras. Ann. Mo. Bot. Gard. **18**: 1-8. 1931.

Linder, David H. Brief Notes on the Helicosporeae, with Descriptions of Four New Species. Ann. Mo. Bot. Gard. **18**: 9-16. 1931.

Moore, George T. Address of Welcome. Proc. 300th Anniversary First Recognized Use of Cinchona. pp. 25-27. 1931.

Moore, George T. Latin America and the Queen of Flowers. Pan-American Bull. **65**: 804-812. 1931.

Moore, George T. Missouri's Collection of Orchids. United States Daily. September 18, 1931.

Moore, George T. Shaw's Garden—What It Does for St. Louis. The Modern View. September 10, 1931.

Perry, Lily M. Concerning a California Convolvulus. Rhodora **33**: 76-77. 1931.

Perry, Lily M. Vascular Flora of St. Paul Island, Nova Scotia. Rhodora **33**: 105-126. 1931.

Pring, George H. Glass Gardens. Ladies' Home Journal. **48**[12]: 14-15. 1931.

Reynolds, Ernest S. Studies in the Physiology of Plant Disease. Ann. Mo. Bot. Gard. **18**: 57-95. 1931.

Roush, Eva M. Fling. A Monograph of the Genus Sidalcea. Ann. Mo. Bot. Gard. **18**: 117-244. 1931.

Shope, Paul Franklin. The Polyporaceae of Colorado. Ann. Mo. Bot. Gard. **18**: 287-456. 1931.

Steyermark, Julian A. A Study of Plant Distribution in Relation to the Acidity of Various Soils in Missouri. Ann. Mo. Bot. Gard. **18**: 41-55. 1931.

Woodson, Robert E., Jr. Apocynaceae. In Gleason, Botanical Results of the Tyler-Duida Expedition. Torrey Bot. Club Bull. **58**: 452-454. 1931.

Woodson, Robert E., Jr. New or Otherwise Noteworthy Apocynaceae of Tropical America. Ann. Mo. Bot. Gard. **18**: 541-556. 1931.

Woodson, Robert E., Jr. New South American Asclepiadaceae. Ann. Mo. Bot. Gard. **18**: 557-563. 1931.

Wynd, F. Lyle, and Harry J. Fuller. Some Effects of Ultra-Violet Radiation upon the Calcium and Phosphorus Content of Higher Plants. Ann. Mo. Bot. Gard. **18**: 565-572. 1931.

Scientific and Popular Lectures.—

Edgar Anderson, Geneticist to the Garden, January 9, South Kirkwood Garden Club; January 30, Webster Groves Nature Study Society; June 15, Webster Groves Nature Study Society.

A. P. Beilmann, In Charge of Trees and Shrubs, March 6, St. Louis Horticultural Society.

Adele L. Grant, Acting Curator of Herbarium, March 4, Asklepios Society of Washington University; March 27, Bird Club of Webster Groves.

Anton Hogstad, Jr., Pharmacognosist to the Garden, December 11, 1930, Philadelphia College of Pharmacy and Science; December 17, 1930, New Jersey College of Pharmacy of Rutgers College; December 17, 1930, before the annual meeting of the staff of Merck & Co., Rahway, N. J.; December 19, 1930, before the New York College of Pharmacy of Columbia University; March meeting of the St. Louis Colloid Medical Club; March, students of ten colleges of Pharmacy, the Iowa State Pharmaceutical Convention (Des Moines) and the Minnesota State Pharmaceutical Convention (St. Paul); April 3, students and faculty of the department of botany, University of Pennsylvania.

L. P. Jensen, Arboriculturist to the Garden, March 10, White River Boosters' League, Lake Taneycomo, Mo.; March 11, joint meeting of the garden department of Sorosis, the City Beautiful, and the Civic Affairs Bureau of the Chamber of Commerce, at Springfield, Mo.; March 17, St. Louis Garden Club; March 20, meeting of the St. Francois County School Superintendents and School Board members, at the High School of Bismarck, Mo.; April 10, South Kirkwood Garden Club; April 12, meeting of citizens of Sullivan, Mo., at the organization of the Garden Club of Sullivan; May 19, citizens of New Haven, Mo., at the organization of the Garden Club of New Haven; June 5, Webster Groves Nature Study Society; September 4, Franklin County

School Teachers' Conference, Union, Mo.; October 29, convention of the American Institute of Park Executives, at Toronto, Canada.

John Kellogg, In Charge of Herbaceous and Nursery Plants, January 19, Webster Groves Nature Study Club.

Paul A. Kohl, Floriculturist to the Garden, March 2, Garden Clubs of Gray Summit, Washington, and Pacific, Mo., at the Gray Summit Extension.

George T. Moore, Director of the Garden, February 6, St. Louis Horticultural Society; March 19, Overhill Men's Club of the First Presbyterian Church; March 25, at the luncheon meeting of the Washington University Alumni Association; March 26, Greater St. Louis Museum of Natural History Association; April 20, Ladies' Aid Society, United Hebrew Temple; April 23, Engineers' Club of St. Louis; April 24, Town and Gown; April 28, St. Louis Florists' Club; October 23, Missouri Historical Society; October 26, St. Louis Section of the American Society of Civil Engineers; November 12, Men's Garden Club of the Chicago Region; December 3, Unitarian Laymen's League; December 15, College Club of St. Louis.

G. H. Pring, Superintendent of the Garden, January 19, University Temple Men's Club; January 23, the Wyman Parent-Teacher Association; January 27, Hamilton School Parent-Teacher Association; January 28, Webster Groves Home Garden Club; February 3, Centennial Garden Club; February 10, Mothers' Club of the Buder School; February 12, Men's Garden Club, Chicago; April 2, Women's Chamber of Commerce; April 10, at Arbor Day celebration of the North St. Louis Business Men's Association; April 13, Fathers' Club of the University City High School; April 14, Wydown Men's Club of the First Congregational Church; April 24, St. Louis Medical Society; April 28, Carondelet Center of the Young Women's Christian Association; May 12, Garden Club of Washington, Mo.; June 3, Art Section of the Scottish Rite Woman's Club; June 30, Missouri State Florists' Association Convention; September 2, East St. Louis Rotary Club; September 23, Roosevelt School Mothers' Circle at the Roosevelt High School; October 21, Parent-Teacher Associa-

tion of the Avery School; November 6, Patrons' Association of the Sherman School; November 20, South Side Republican Women's Club; November 20, Practical Arts Club.

Hermann von Schrenk, Pathologist to the Garden, March 25, Missouri Historical Society; April 14, Missouri Historical Society; April 30, Engineers' Club of St. Louis; May 25, St. Louis Chapter of the American Society of Civil Engineers.

HERBARIUM

Regular work in the herbarium has continued throughout the year, substantial progress has been made in further organizing the material already on hand, and a relatively large amount of new material has been added during the year. The entire collection of mounted specimens is now in steel cases which give adequate protection to the valuable and irreplaceable specimens accumulated during the past eighty years, or since the herbarium was founded in 1852.

New Accessions.—Among the larger and more important collections obtained during the year are the following: Arnold Arboretum, 675 plants of southern and southwestern United States, collected by E. J. Palmer; E. E. Berkley, 1,000 plants of West Virginia; J. W. Blankinship, 683 plants of Lake County, California; Botanical Garden and Museum, Berlin, Germany, 155 herbarium specimens and photographs; Botanical Institute, Carls University, Prague, 100 plants of Czechoslovakia; Botanical Museum, University of Cluj, 100 plants of Roumania; British Museum of Natural History, 40 photographs of plants; W. E. Broadway, 116 plants of Trinidad; Museo Nacional de Historia Natural de Buenos Aires, 161 plants of Argentina; Bureau of Science, Manila, 100 plants of the Philippine Islands; B. F. Bush, 219 plants of Missouri; Canton Christian College, 450 plants of China; Marion Child (Mrs. H. Moss), 600 plants, chiefly from Missouri; R. Ciferri, 209 fungi of the Dominican Republic; O. M. Clark, 114 plants, chiefly from Texas; A. Donat, 100 plants of Patagonia; J. A. Drushel, 229 plants of Texas, New Jersey, and New York; Dudley Herbarium, by Dr. LeRoy Abrams, 558 plants of southern and Lower California; C. C.

Epling, 327 plants of southern California and 100 plants of India; J. Ewan, 60 plants of California; Farlow Herbarium, 58 mosses and lichens, collected by Dr. David Linder in tropical Africa; Field Museum of Natural History, 249 plants of South America and 65 photographic prints of type specimens; G. J. Goodman, 1,140 plants of Wyoming, Colorado, and Utah; G. J. Goodman and C. L. Hitchcock, 1,205 plants of western United States; Gray Herbarium, Harvard University, 246 miscellaneous duplicates; J. M. Greenman, 197 plants of Utah; Mildred Mathias Hassler (Mrs. G. Hassler), 280 plants of California; G. Herter, 116 plants of Uruguay; C. A. Hoffman, 125 plants of Persia; M. E. Jones, 1,643 plants of western United States; P. Jörgensen, 218 plants of Paraguay; D. D. Keck, 121 plants of California; Miss E. M. Kittridge, 88 plants of Vermont; J. H. Kellogg, 366 plants of Missouri; M. Kerbosch, 175 economic plants of the Dutch East Indies; E. P. Killip, 503 plants of Colombia; W. Migula, 150 plants of Germany, Austria, and Switzerland; H. N. Moldenke, 1,509 plants of southern United States; J. A. Moore and J. A. Stevermark, 693 plants of Texas and Wyoming; H. O'Neill, 137 plants of Florida and Brazil; L. O. Overholts, 98 parasitic fungi; Philadelphia Academy of Natural Sciences, 36 Senecios from Peru and Chile; H. Pittier, 163 plants of Venezuela; M. P. Porsild, 438 plants of Greenland; Riksmuseets, Botaniska Avdelning, Stockholm, 428 plants of Cuba and 889 plants of Europe; W. A. Schipp, 123 plants of British Honduras; A. Schmalz, 188 plants of Brazil; Smithsonian Institution, by W. R. Maxon, 594 plants of Haiti; E. E. Stanford, 200 plants of California; J. A. Stevermark, 692 plants of Maine, Illinois, and Missouri; J. W. Thompson, 2,576 plants of Washington; Bureau of Plant Industry, United States Department of Agriculture, 150 specimens of *Coleosporium solidaginis;* United States National Herbarium, 700 plants of western United States and South America; University of Brno, 100 plants of Czechoslovakia; University of California, 1,279 plants of California, Jamaica, and China; University of Minnesota, 900 plants of Minnesota, North Dakota, and South America; University of Utah, 109 plants of Utah; University of Wyom-

ing, 568 plants, mostly from Wyoming; E. J. Valeur, 153 plants of San Domingo; Fr. Verdoorn, 150 Hepaticae; Th. Oswald Weigel, 50 specimens of Weese's "Eumycetes selecti exsiccati;" and E. Werdermann, 538 plants of Bolivia and Chile. In addition to these, many small gifts have been received from local botanists and friends of the Garden. All accessions have been duly recorded in the current numbers of the BULLETIN.

The main additions to the herbarium, as shown by the above enumeration, have been from western United States, South America, the West Indies, Central America, Europe, and Asia. It is important also to record the acquisition of a relatively large number of photographs of type specimens from various American and European institutions. These have been of great value in the special taxonomic studies either recently completed or now in progress.

Mounting and Inserting of Specimens.—The mounting of specimens has gone forward rapidly, and by the employment of a second mounter on part time it has been possible to mount nearly all material acquired during the year, hence 25,080 mounted specimens have been added to the regular herbarium during the fiscal year.

Exchanges.—Seven thousand four hundred and seventy-seven specimens have been received during the year on the basis of exchange; and during the same period of time 13,983 duplicate herbarium specimens have been sent to correspondents and to other herbaria.

Distribution and Reorganization of Specimens.—Distribution of new material has followed closely the work of mounting. The reorganization of material already in the herbarium has been pushed forward as rapidly as possible with the limited herbarium staff. Several large families of flowering plants were completely rearranged during the summer when laboratory facilities and table space were available. In all this work the more advanced graduate students in taxonomy have rendered valuable assistance.

Field Work.—Field work has been continued on a limited scale. The Curator collected nearly 200 specimens in

the Uintah Mountains of Utah; these were presented to the Garden and have been incorporated in the herbarium. Mr. J. H. Kellogg of the Garden staff has added 366 plants of Missouri. The representation of our local flora has been augmented by many small gifts by graduate students and friends of the Garden.

Use of the Herbarium by Outside Botanists.—It is a pleasure to record again the increase in use made of the herbarium and library facilities by local and out-of-town botanists. Several loans of specimens have been made for study by specialists and research students in different parts of the country, thus greatly extending the use of the rich collections preserved in the herbarium; likewise generous loans have been made to the Garden for study by members of the staff and by advanced students in the Shaw School of Botany. In this matter a most cordial spirit of coöperation has been manifested on the part of American and foreign institutions.

Statistical Summary (For the year ending December 31, 1931).

Number of specimens received on new accessions:

By purchase	17,208	
By gift	2,011	
By exchange	7,477	
By field work	363	
By transfer	21	
Total	27,080	valued at $3,385.00
Number of specimens mounted and incorporated	25,818	valued at 5,163.60
Number of specimens discarded from the herbarium	144	without value
Number of specimens in organized herbarium	1,012,209	valued at $164,066.80
Number of specimens in unorganized herbarium	88,131	valued at 8,813.10
Wood specimens, etc., in the herbarium		valued at 280.00
Microscope slides		valued at 450.00
Total valuation		$173,609.90

LIBRARY

Except for the acquisition of some rare books, the year 1931 might be classified as a normal one in the library. However, catalogues of botanical books for the year have been more than unusually tempting, and at least one of the works purchased through this means is worthy of especial mention. This is Vellozo's "Flora Fluminensis," consisting of 11 folio volumes of plates and one of text, published in 1827. Ever since taxonomic research has been carried on at the Garden this work has been needed. Although it was to be found in several libraries in the country, they would not lend it because of its size and rarity, and it was often necessary to ask for a transcription of certain pages. Vellozo was a Franciscan monk from Rio de Janeiro, with an especial genius for botany and languages, and thus well fitted to write the descriptions of the Brazilian plants. He was fortunate, so the prospectus says, "in finding in the interior of his cloister, among his confreres, able artists, whose purity of execution leaves nothing to desire in the originals, after which are made the beautiful reproductions already admired by connoisseurs." The drawings were sent to Paris to be reproduced by Knecht, the successor of Senefelder, who was the inventor of lithography. Sixteen hundred and forty plants are illustrated, each drawn to full scale, the pages measuring about 15 x 24 inches, and printed on very beautiful paper. The author of the prospectus states truly when he says the work is an "example of beautiful bibliography."

During the summer the back numbers of the Garden publications were moved from the basement of the library and office building to the shelves along the wall of the lecture room of the museum building. The new location, besides being light and free from dampness, affords more space for storage than the old basement. At the same time the duplicate books and pamphlets which also had been stored in the basement were listed, and it is hoped that the entire collection can be disposed of in the near future.

In February the two bookbinders, employed each year for repairing books, spent two weeks in the library. Two hundred and forty-four books were repaired during that time.

In July about 700 reprints from the ANNALS were mailed to some 300 botanists in exchange for their publications.

Use of the Library.—In addition to the staff and students of the Shaw School of Botany the following botanists have consulted the library during the year: Mr. W. W. Ashe, assistant district forester, United States Forest Service; Dr. Martha L. Beardsley, professor of biology, Sioux Falls College, Sioux Falls, S. D.; Mr. John A. Cameron, instructor in zoölogy, University of Missouri, Columbia, Mo.; Dr. H. H. Card, formerly Rufus J. Lackland Research Fellow at the Garden; Mr. Lloyd C. Cochran, graduate student and assistant in plant pathology, Michigan State College, East Lansing, Mich.; Dr. E. E. Dale, assistant professor of biology, Union College, Schenectady, New York; Prof. H. B. Dorner, professor of floriculture, University of Illinois; Mr. Frederick Dunlap, Missouri State Forester, Columbia, Mo.; Mr. Francis Drouet and Mr. E. E. Naylor, graduate students in botany, University of Missouri; Dr. Ethel T. Eltinge, instructor in botany, Mt. Holyoke College, South Hadley, Mass.; Prof. H. I. Featherly, associate professor of botany and plant pathology, and Prof. Robert Stratton, associate professor of botany and plant physiology, Oklahoma Agricultural College, Stillwater, Okla.; Mr. Kazuo Gotoh, of the University of Taihoku, Formosa, Japan; Miss Catharine M. Lieneman, North Carolina College for Women, Greensboro, N. C.; Prof. Andrew C. Life, professor of botany, University of Southern California; Dr. Paul C. Mangelsdorf, agronomist, and Dr. S. H. Yarnell, horticulturist, Texas Agricultural Experiment Station, College Station, Texas; Dr. Mildred E. Mathias, formerly research assistant at the Garden; Dr. G. W. Martin, professor of botany, University of Iowa; Prof. D. M. Moore, professor of botany, University of Arkansas; Dr. P. A. Munz, professor of botany, Pomona College, Claremont, Cal.; Mr. Myron Arthur Rice, instructor in botany, Clemson Agricultural College, Clemson College, S. C.; Dr. J. W. Severy, associate professor of botany, University of Montana; Dr. Paul F. Shope, assistant professor of biology, University of Colorado, Boulder, Colo.; Dr. E. R. Spencer, professor of botany, McKendree College,

Lebanon, Ill.; Dr. J. Arthur Turner, professor of botany, Stowe Teachers' College, St. Louis; Prof. Frank B. Wann, associate professor of botany, Utah Agricultural College, Logan, Utah; Dr. Leva B. Walker, associate professor of botany, University of Nebraska, Lincoln, Neb.; Dr. N. I. Vavilov, Director of the Institute of Applied Botany, Leningrad, U. S. S. R.

In addition, Prof. J. T. Bucholz, professor of botany, University of Illinois, and Prof. H. W. Rickett, associate professor of botany, University of Missouri, accompanied the departments of botany from their respective institutions, on a visit to the Garden library and herbarium.

Garden Publications.—Volume XVIII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN, consisting of 612 pages, 47 plates, and 27 text-figures, was completed during the year. Volume XIX of the monthly BULLETIN was also published in 1931 and comprises 169 pages and 37 plates. In March the PROCEEDINGS OF THE CELEBRATION OF THE THREE-HUNDREDTH ANNIVERSARY OF THE FIRST RECOGNIZED USE OF CINCHONA was published, the volume containing 258 pages and 5 plates. The cash receipts during the year from the sale of ANNALS, BULLETINS, reprints, BOOK OF VIEWS, CINCHONA ANNIVERSARY PROCEEDINGS, etc., was $3,835.68. Both ANNALS and BULLETIN are also sent in exchange for other publications. Four hundred and eighteen foreign institutions and 124 domestic ones send the Garden their publications in exchange for the ANNALS, and 45 foreign and 48 domestic institutions are on the exchange list for the BULLETIN.

New Accessions.—One of the important gifts during 1931 was a collection of nearly 60 botanical pamphlets from John Crerar Library, Chicago. In addition to the publications received by gift or exchange, the Garden has purchased many publications, of which the following are noteworthy: Acta Phaenologica—new serial; Blossfeldt, Urformen der Kunst; Bresadola, Iconographia Mycologica, pts. 15-18; Brieger, Selbststerilität und Kreuzungssterilität im Pflanzenreich und Tierreich; Buller, Researches on Fungi, Vol. 4;

Burnat, Flore des Alpes Maritimes, Vol. 6, Nos. 1 and 2; Clements and Shear, The genera of fungi; Cytologia (Japanese)—new serial; Elliot, Manual of bacterial plant pathogens; Engler, Das Pflanzenreich, pt. 97; Engler and Prantl, Natürlichen Pflanzenfamilien, Vols. 19a and 19c; Ewart, Flora of Victoria; Gassner, Mikroskopische Untersuchung pflanzlicher Nahrungs und Genussmittel; Grieve, A modern herbal; Grimwade, An anthography of the Eucalypts; Handbuch der Pflanzenanalyse, Vol. 1; Handbuch der Pflanzenernährung und Düngerlehre; Hurry, The woad plant and its dye; Index generalis; Proceedings of the Fifth International Botanical Congress; Iconum botanicarum index Londinensis, Vols. 5 and 6; Jaccottet, Die Pilze in der Natur; Johnson, Taxonomy of the flowering plants; Korschelt, Regeneration und Transplantation, Vol. 2, teils 1 and 2; Konrad and Maublanc, Icones selectae fungorum, Vol. 6; Lehmann and Aichele, Keimungsphysiologie der Gräser; Lemée, Dictionnaire descriptif et synonymique des genres plantes phanorogames; Lettsom, The natural history of the tea-tree; Lundegardh, Environment and plant development; Onslow, The principles of plant biochemistry, pt. 1; Pascher, Die Süsswasser-flora Deutschlands, Oesterreichs u. d. Schweiz, ed. 2, vols. 10 and 14; Plant buyers index—2nd ed.; Priestley, Experiments and observations on different kinds of air, 3 vols. 1790; Protoplasma Monographien, Vol. 4; Radl, The history of biological theories; Rafinesque, Alsographia Americana; Retzius, Observationes botanicae; Sanders' list of orchid hybrids; Sarton, Introduction to the history of science, Vol. 2; Seward, Plant life through the ages; Sherman and Smith, The vitamins; Skottsberg, Natural history of Juan Fernandez and Easter Island, Vol. 1, pt. 1, Vol. 2, pts. 1-4, Vol. 3, pts. 1-4; Smyth and Obold, Industrial microbiology; Strasburger, Text-book of botany, 17th edition; Thaysen and Galloway, The microbiology of starch and sugars; Thomson and Geddes, Life: Outlines of general biology, Vols. 1 and 2; Van Rijn, Die Glykoside, 2nd ed.; Vellozo, Flora fluminensis, 12 vols.; Vuillemin, Encyclopedie mycologique; Les champignons parasites et les mycoses de l'homme; Wells, Huxley, and Wells, The science of

life; Wilson, If I were to make a garden; Zweigelt, Blattausgallen.

Statistical Information.—There have been donated to the library or received in exchange during the year 512 books valued at $1,119.83, and 1,788 pamphlets valued at $406.53. Three hundred and seventy-seven books were purchased at a cost of $3,286.78, and 76 pamphlets at a cost of $131.83. There are 331 manuscripts in the library, valued at $1,614.80, and 990,345 index cards valued at $11,914.54. A total of 8,517 cards were added during the year, of which 1,544 were written by Garden employes and 6,973 were purchased at a cost of $167.81. Three hundred and ninety-nine books were bound and 247 repaired.

George T. Moore,
Director.

STATISTICAL INFORMATION FOR DECEMBER, 1931

GARDEN ATTENDANCE:

Total number of visitors	18,865

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	25
Total number of books and pamphlets donated	110

PLANT ACCESSIONS:

Total number of plants donated	4,615

HERBARIUM ACCESSIONS:

By Purchase—

Donat, Dr. Artur—Plants of Patagonia	100
Field Museum of Natural History—Photographic prints of type specimens	48
Jones, Prof. Marcus E.—Plants of western United States	710
Migula, Dr. W.—Cryptogamae Germaniae, Austriae et Helvetiae exsiccatae, Fascicles 50-55, inclusive	150
Moore, J. A., and J. A. Steyermark—Plants of western Texas	73

By Gift—

Bull, Miss Rotha—Plants of Oklahoma	2
Drushel, Prof. J. A.—Plants of New Jersey, Texas, etc.	229
Hapeman, Dr. H.—*Solidago Hapemaniana* Rydb. from Nebraska	1
Perry, Miss Lily M.—*Alchemilla glomerulans* Buser from Greenland	1
Volz, Prof. E. C.—*Solanum aculeatissimum* Jacq. from horticulture	1

By Exchange—

Botanical Institute, Karls University—"Flora Cechoslovenica exsiccata" Cent. II, Nos. 101-200, inclusive	100
Botanical Museum, University of Cluj, by Prof. Al Borza—"Florae Romaniae Exsiccatae" Nos. 901-1000, inclusive	100
United States National Museum—Plants of western United States collected by W. W. Eggleston	61
University of Minnesota, by Dr. C. O. Rosendahl—Plants of North Dakota	443
University of Wyoming, by Prof. A. Nelson—Plants of Wyoming, etc.	568
Total	2,587

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
First half month—Orchids.
Second half month—Cinerarias.

MARCH

(Floral Display House)
March 1-15—Bulb Show.
March 19-22—St. Louis Florists' Show.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlia (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

STAFF
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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XX FEBRUARY, 1932 No. 2

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Floral Displays of Special Interest in 1932

ST. LOUIS, MO.
1932

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OF THE MISSOURI BOTANICAL GARDEN

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GLASS GARDEN TWO YEARS OLD
(Hardy primroses, bird's-foot violet, dwarf philodendron, dianthus, ceratostigma)

Missouri Botanical Garden Bulletin

Vol. XX FEBRUARY, 1932 No. 2

MINIATURE GLASS GARDENS FOR THE HOME

In October, 1930, there was printed in the BULLETIN an article on "Miniature Glass Gardens" which was so much in demand that the edition was soon exhausted. Since the demand is still continuing, the article has been brought to date, and is herewith reprinted:

Although the Wardian case as a means of shipping plants successfully between widely separated countries has long been well known to both botanical and commercial institutions, it is only within comparatively recent years that miniature Wardian cases, or glass-enclosed gardens, for the home have become popular, or have seemed even feasible. The November, 1914, number of the BULLETIN contained an extensive article on the history, use, and construction of Wardian cases, and therefore only a short resumé will be given here.

Nearly a hundred years ago, Nathaniel Ward, a London physician, stumbled upon a method of raising and keeping plants in an environment supposedly quite unsuited to them. He had built for himself in his London garden a brick-walled corner and had carefully planted it with the mosses and ferns which he so earnestly desired to grow. Much to his distress the fog and smoke of London killed all his plants one by one. One day he discovered the cocoon of a sphinx moth, placed it in a large-mouthed glass bottle containing some rich, damp loam, and covered it with a lid. Much to

his surprise, within a few weeks a young fern and small grass plant made their appearance and continued to grow in the covered bottle. For nearly four years he kept these plants in the bottle and would have probably kept them indefinitely had the bottle not been accidentally destroyed.

Dr. Ward then began to experiment with many plants in cases of various sizes and shapes until finally his invention found a very practical use in transporting plants between foreign countries. In those days of sailing vessels, when a voyage might last for eight months, especially when it involved crossing the equator, the transportation of plants was a difficult problem. They would die from cold, from heat, from lack of water, from gases in the hold of the ship, etc. In 1833 two cases were filled with plants and sent from England to Sydney, Australia, where they were emptied, refilled with other plants and sent back. The cases were kept on deck and the plants not once watered during the eight-months voyage, yet they arrived in perfectly healthy and vigorous condition. A letter from Captain Mallard, in charge of this ship, to Dr. Ward, concludes: "Allow me to offer you my warm congratulations upon the success of this simple but beautiful discovery for the preservation of plants in the living state upon the longest voyage; and I feel not a little pride in having been the instrument by which the truth of your new principle has been fully proved by experiment."

Elaborate instructions as to the making of small Wardian cases for the home have appeared in various publications during the past few years, but to the ordinary householder without the gift of carpentry, building the necessary wooden framework and fitting it with glass seems too great a task. Looking about for some easier method of bringing a bit of the summer woods indoors for the winter, Miss Ruth Barry, one of the most successful amateur gardeners in St. Louis, had the happy inspiration of building these small gardens in glass globes, thus eliminating the labor of construction, as well as reducing the expense so as to bring the gardens within reach of almost any one. After considerable experimentation the type of globe decided upon as producing the best results was a two-gallon clear-glass aquarium with two flat sides and a round hole at the top. Smaller sizes of the

GLASS GARDEN SIX MONTHS OLD
(Red cedar, greenhouse ferns, and mosses.

GLASS GARDEN ONE YEAR OLD
(Red cedar and club moss)

same type can of course be used, but then the difficulty of keeping the scale of the plants and finished garden down to that of a smaller bowl is hard to overcome. These bowls may be purchased at any department store or shop where goldfish are for sale. It should be borne in mind that the glass must be clear, since the plants will not flourish in bowls of tinted glass.

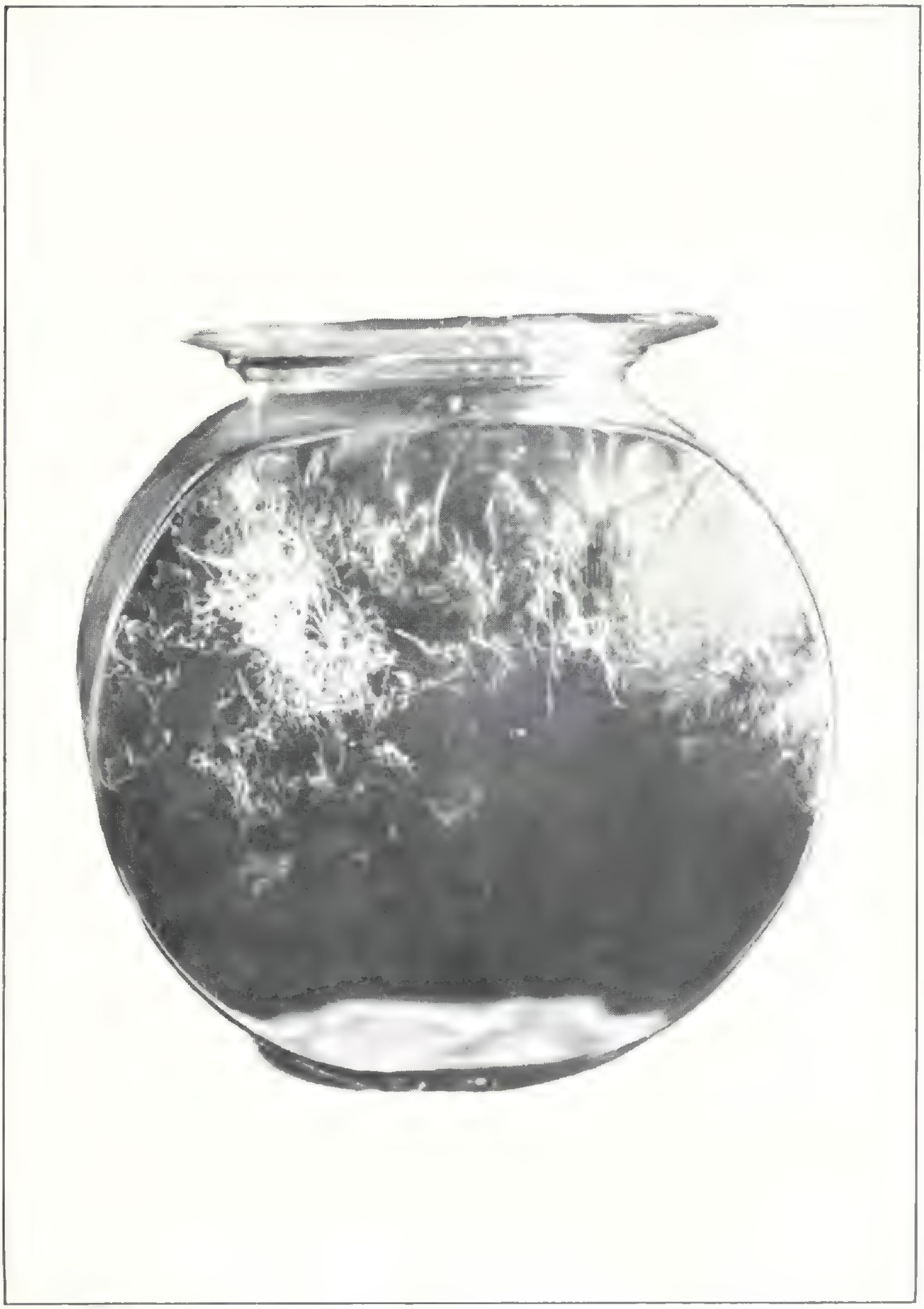
After cleaning and polishing the bowl, place a large handful of charcoal chunks in the bottom, to aid in keeping the soil "sweet." A handful of broken flower pots is then added and the bowl lined with green moss from the woods up to approximately one-third its height, and a few stones and shells inserted here and there against the glass to add a variety of color. The moss will continue to grow upward through the soil and give the appearance of a miniature forest. The mixture of soil usually advocated is one-third each of ordinary garden soil, leaf mold, and sand, and these proportions can very well be followed by those who do not have access to natural leaf mold from the woods. It has been found, however, that if the plants come from the woods (and these are on the whole the most successful) well-rotted leaf mold collected in the woods at the same time as the plants, combined with one-third sand, makes an ideal soil for the gardens. The soil should be saturated with water, that is, it should be so wet that when taken in the hands and placed in the bowl the water almost drips from it. Fill the bowl about one-third full of this soil, arranging it unevenly so as to give the effect of a natural woodland, with tiny hills and valleys.

Naturally, the most important matter now is what plants to use and where to obtain them. Experience has taught that the best source of supply is our own native woods. It is not necessary to go far from the city to find a wealth of material admirably well suited for the purpose. A brookside leading from a spring which has not gone dry during the summer is a good collecting place. Gather quantities of soft, green moss, all the varieties that can be found growing on soil for planting on the soil, and the varieties that grow on wood for lining the bowl, the tiniest ferns that can be found, the smallest imaginable seedlings of spruce, pine,

and cedar, none over three inches in height. Until you have made one of these gardens it is almost impossible to realize how very small the plants must be to conform to the scale of the finished garden. In case it is impossible to gather material in the woods, a successful garden may be made from such plants as very small palm seedlings, snake grass, myrtella, selaginella, croton, green and white variegated pandanus, etc. Sprigs of box, partridge berry, or barberry stuck in the soil will root and grow most effectively. In general, avoid plants with succulent leaves and stems, with the one exception of the common begonia. Rooted cuttings of begonia, which begin to bloom almost at once, add a pleasing touch of color to the small garden and if carefully watched will last a long time. Half the fun of these gardens, however, is the trip to the woods for material. As late as the middle of November, in small gulleys under fallen leaves, may be found quantities of baby ferns and fat hummocks of bright green moss to use in making the gardens for Christmas gifts.

After all the larger plants are arranged according to individual fancy and planted, the surface of the ground should be covered with as many varieties of moss as can be found and very small-leaved ground-cover plants. A few small boulder-shaped rocks, a shell or two, tiny Buddhas or dwarf figures, if desired, may be used beneath the trees. Very small, round mirrors, shellacked on the back to prevent penetration of moisture, make quite natural-appearing lakes. Ambitious makers of these gardens follow a definite landscape plan, with paths and pergolas and even miniature rock gardens.

Since these small gardens have become popular, two definite types seem to have developed, according to the individual taste of the owner: the so-called "jungle garden," in which everything originally planted, which may consist almost exclusively of tropical plants, and everything which comes up of its own accord is allowed to grow untended, simply for the interest of seeing into what the garden will develop without care; and the other, "natural" or "landscape type," where the plants are pinched back and kept down to scale in order to preserve the original plan, a reproduction



SELAGINELLA GROWN IN GLASS BOWL FOR ABOUT TWO YEARS
(A so-called jungle garden

A LANDSCAPE GARDEN MADE ENTIRELY FROM NATIVE WILD MATERIAL

of a woodland scene. This latter type is certainly the more artistic and can best be achieved by the use of native material from the woods.

When the garden is planted, carefully clean from the glass all smears of soil, place a flat glass plate on top as a lid and establish the bowl in a window. It should never be placed in direct sunlight, since the intense heat created inside the closed bowl will injure the plants in an almost unbelievably short time. Keep the glass lid on the bowl almost constantly. The moisture observed on the inside of bowl and lid each morning will fall on the plants and be absorbed later in the day. Look at the garden each day, and if at any time mold is observed on the soil or plants or if the plants are growing very tall and thin, tip the lid to one side a trifle and leave it so for a half day. Test the soil once in a while with the finger to see if it is moist, and if not, sprinkle very lightly with a fine spray of water. This should very seldom be necessary, however, since the moisture which naturally forms inside the bowl is sufficient for the plants. These gardens may be kept for many years practically with the same contents as when started, though occasional replacements with smaller plants or fresh moss are sometimes desirable. Keeping the air free from soot, the temperature even, the moisture content constant, and the air quiet yet with sufficient ventilation, makes possible success with these gardens in the unfavorable environment of the average home.

K. H. L.

NEW PLANT IMMIGRANTS IN THE GRAY SUMMIT EXTENSION OF THE GARDEN

Tragopogon pratensis L. (yellow goat's-beard).—A perennial herb with stout, stiff stems 2–3 feet high. Flowers yellow, mostly terminal, opening at night, closing at noon, for which reason the plant has been called the "go-to-sleep-at-noon" plant. It is a native of Europe, from where it migrated to North America and became established in fields and waste places in Ontario, Manitoba, New Jersey, and Ohio, also in Missouri. Its appearance at the Garden was first noticed in June, 1931. The plant is unusually striking and

conspicuous on account of its height and its ball-like heads of seeds which resemble the dandelion except that those of the goat's-beard are about five inches in diameter. If the stems are cut when the seed balls are fully developed, and kept out of strong air currents, they may be preserved in perfect condition for an indefinite period (pl. 13) and make an attractive and novel late-summer and winter decoration for the home.

Lythrum Salicaria L. (spiked loosestrife).—A perennial herb 3–5 feet high, with compound terminal spikes of showy purple flowers (pl. 14). It is an inhabitant of swamps and wet meadows from Cape Breton Island to Ontario, south to southern New York and Delaware. It is supposed to have been introduced from Europe, where it is widely distributed. It is a beautiful plant well worthy of being cultivated and grown in a moist situation in the garden or naturalized along the borders of lakes.

In July, 1930, a flowering plant of the spiked loosestrife was found at the west side of the greenhouse range at the Garden Extension, and a few days later another was seen in a gulley between the greenhouses and the lake in the pinetum. In 1931 it had become established in several places along the shore of the lake. The cause of its appearance there, so far from its first habitat, was at first a mystery, but later investigation gave the following explanation: Some peat from bogs inhabited by Lythrum had been shipped from New York State and dumped at the west side of the greenhouses. Seeds of the plant had been washed out of the bales of peat, had germinated, and produced the first plants. Later, water carried some of the seed to the locality where the second plant was found, and other seed to the edge of the lake.

Verbena hastata L. (blue vervain).—Herbaceous perennial 3–5 feet high, bearing numerous spikes of dark blue flowers. The plant is found growing in moist fields from Nova Scotia to British Columbia, south to Florida, Nebraska, and New Mexico, and is very abundant in the wet meadows along the Mississippi and Missouri rivers in St. Charles

SEED BALLS OF TRAGOPOGON PRATENSIS
June, 1931

SEED BALLS OF TRAGOPOGON PRATENSIS AFTER HAVING BEEN CUT AND DRIED FOR EIGHT MONTHS

CHRYSANTHEMUM LEUCANTHEMUM

LYTHRUM SALICARIA

County. In the summer of 1931 it was found along the shores of both lakes at the Garden Extension, evidently having come from seed adhering to the feet of migratory water birds.

Asclepias incarnata L. (swamp milkweed).—A perennial 2–3 feet high, producing rose or flesh-colored flowers in June and August. It is found in swamps from New Jersey to Florida and Texas, also in Missouri. A plant was found at the Garden Extension last summer, in the exotic section, on dry ground, about 200 feet from Brush Creek. The seed was probably carried there by wind, their parachute-like appendages enabling them to be carried long distances.

Chrysanthemum Leucanthemum L. (ox-eye daisy).—This well-known perennial is commonly found in fields and meadows and is included in the discussion, not because it is a new arrival but because of its rapid multiplication. From a few plants in 1926 it has now become an attractive feature of the landscape at the Garden Extension, particularly along one of the woodland trails (pl. 14). L. P. J.

EFFECT OF CITY SMOKE ON PLANTS

From time to time reference has been made in the BULLETIN to damage to plants at the City Garden from excessive smoke clouds. In the November, 1917, number of the BULLETIN some of the plants most seriously affected were listed, and in January, 1928, a more complete list of damaged plants was published. It seems desirable that as complete a record as possible be kept of the occasional serious results of an atmosphere laden with smoke and toxic gases. Consequently, the following list is printed, enumerating those plants which suffered most severely from the cloud of December 17-18, 1931. This is a record of only those plants which exhibited damage immediately or within a comparatively short time and takes no account of the more or less checking or weakening effect such an atmosphere must have had on all vegetation. Such damage can only be estimated, but that it is real can be demonstrated easily by a compari-

son of the growth of plants, both out of doors and under glass, at Gray Summit and in St. Louis.

PLANTS SHOWING IMMEDIATE DROPPING OF GREEN LEAVES

Acacia longifolia
Begonias
Camoensia maxima
Cestrum elegans
Citrus
Clarkia elegans
Dipholis salicifolia
Eupatorium glabratum
Ficus retusa nitida
Fuchsias
**Ilex opaca* (some specimens becoming deciduous)
**Ligustrum*
Pithecolobium filicifolium
Tamarindus indica

PLANTS SHOWING LEAF BURN

Ageratum (edges of leaves)
Alyssum rostratum
Aristolochia grandiflora
Arundo Donax (entire leaves)
Bromeliads (especially *Aechmea Barleei*)
Carica Papaya
Centaurea dealbata
Cheiranthus Allionii
Chrysanthemum frutescens (tips of leaves)
Cinchona officinalis (all leaves, plants killed)
Cinerarias
Clerodendron Colebrookianum (all leaves)
Coccoloba grandifolia (edges of leaves)
Coffea arabica (tips of leaves)
Dianthus
Dimorphotheca aurantiaca
Echinopsis
Eichhornia speciosa (entire leaves)
Ferns (all species, particularly Adiantum)
Fittonia
Gardenia jasminoides
Gossypium mexicanum
Gypsophila paniculata
Marica gracilis (tips of leaves)
Matricaria capensis
Musa (edges of leaves)
Myosotis palustris
Nicotiana (tips and edges of leaves)
Nymphaea (Lotus and Brachyceras types—entire leaves)
Ornithogalum thyrsoides (tips of leaves)
Pentas
Pistia Stratiotes (entire leaves)
Potentilla
Primula kewensis (badly burned)
Richardia africana
Selaginella cuspidata
Stokesia cyanea
Urginea maritima (tips of leaves)
Ursinia anthemoides
Verbena
Veronica longifolia
Victoria regia (all leaves burned, plants killed)

* Outdoor plants.

PLANTS SHOWING IMMEDIATE YELLOWING AND DROPPING OF LEAVES

Acalypha
Anthuriums (edges of leaves yellowing, later turning black)
Buddleia
Cattleyas (leaves, buds in sheath, and open flowers)
Cypripediums (basal leaves)
Dendrobiums (leaves, buds, and flowers, especially of *D. phalaenopsis*)
Euphorbia splendens (total defoliation)
Ficus Carica
Hydrocleis nymphoides
Moschosma riparium (total defoliation)
Myriophyllum proserpinacoides (all leaves)
Nepenthes (leaves and pitchers)
Parkia Roxburghii
Pelargonium
Phalaenopsis (leaves, buds, and flowers)
Poinsettias (leaves and bracts)
Primula obconica
Primula stellata
Punica Granatum (total defoliation)
Thalia divaricata

PLANTS SHOWING SUBSEQUENT YELLOWING AND DROPPING OF LEAVES

Aglaonema
Alternantheras
Aquilegias
Arabis alpina
Asparagus Sprengeri
Azaleas
Bougainvillea glabra
Calendula
Campanula Medium
Clerodendron Thomsonae
Codiaeum variegatum (crotons)
Crinum
Cyclamen
Digitalis purpurea
Dracaena
Erigeron speciosus
Ficus (all species)
Gaillardia aristata
Geraniums
Helenium "Riverton Gem"
Hibiscus
Lantana
Linum grandiflorum
Lychnis chalcedonica
Monstera deliciosa (tips)
Palms (tips, especially genus Cocos)
Pansies
Primula malacoides
Primula Polyantha
Rhoeo discolor
Schismatoglottis
Solanum Pseudo-capsicum (leaves and fruit)
Stachys lanata
Sterculia platanifolia
Stranvaesia Davidiana
All plants in economic house
Outside lawns (tips of leaves yellowing but not dropping)

G. H. P.

AN INEXPENSIVE INK FOR WRITING PLANT LABELS

For the past six years the Garden has been using a cheap black ink as a substitute for the platinum tetrachloride formerly used in writing plant labels. Since thousands of labels were written annually at the Garden and the platinum tetrachloride cost about thirty dollars an ounce the amount spent for labeling was considerable. During the war the price of the chemical reached sixty dollars an ounce, and it was then that new ink formulas were devised. Several were tried out, but none proved satisfactory. However, six years ago this new formula was discovered, and subsequent tests at the Garden have shown that the new ink is just as permanent as the old, and that the price is within reach of all.

Directions.—Procure a wide-neck bottle with a glass stopper. Fill it half full of new copper chips, such as may be obtained from a tinsmith. Add commercial muriatic acid to fill the bottle and allow the mixture to stand for eight weeks. During that time the color of the fluid will gradually change from bright amber to a cloudy dark emerald green and will finally become clear. After the eighth week pour off the clear acid from the copper chips, the liquid then being ready for use as ink. Unless the zinc label is thoroughly cleaned with a fine-grade emery paper to remove grease and finger marks the ink will not penetrate, while the cleaner the label surface the blacker will be the writing. Use a gold or glass pen for writing. To remove the writing use the straight muriatic acid, then rub with a rough emery paper, finally polishing with a very fine emery paper.

G. H. P.

NOTES

The St. Louis Wild Flower Club met at the Garden February 5.

Mr. L. P. Jensen, Manager of the Gray Summit Extension of the Garden, has been appointed chairman of the standing committee on horticulture of the American Institute of Park Executives.

Mr. G. H. Pring, Superintendent of the Garden, attended the ninth annual Florists' Week at the University of Illinois, sponsored by the department of horticulture, and on February 4 spoke on "Glass Gardens."

Dr. Georg Tischler, professor of botany, Christian-Albrechts University, and director of the Botanical Institute and Gardens, Kiel, Germany, delivered a lecture at the Garden, February 18, on "Chromosomes and Inheritance."

Mr. G. H. Pring, Superintendent of the Garden, spoke before the Quest Club, January 26, on "The Development of the Orchid;" and before the St. Louis Horticultural Society, February 5, on "The Royal Botanic Gardens, Kew."

Dr. George T. Moore, Director of the Garden, spoke before the Citizens' Smoke Abatement League, at the Public Protest Luncheon, at the Hotel Statler, February 3, on "The Effect of Smoke on Plants;" and before the Executives Club of St. Louis, February 23, on "Advertising St. Louis with Flowers."

The February issue of "Parks and Recreation" (Vol. 15, No. 6) contains the paper read before the American Institute of Park Executives by Mr. L. P. Jensen, Manager of the Gray Summit Extension of the Garden, on "Arboricultural Development in the Missouri Botanical Garden." The article was illustrated with photographs of the Gray Summit Extension.

Recent visitors to the Garden library and herbarium include Dr. Edgar Anderson, arborist, Arnold Arboretum, Jamaica Plain, Mass.; Dr. Henry Schmitz, professor of forestry, University of Minnesota; Dr. Georg Tischler, professor of botany, Christian-Albrechts University, and director Botanical Gardens and Institute, Kiel, Germany; Dr. D. T. MacDougal, research associate, Desert Laboratory, Carnegie Institution of Washington, Tucson, Ariz.; Dr. Grace E. Howard, assistant professor of botany, Wellesley College. Wellesley, Mass.; Dr. Ada Hayden, assistant professor of botany, Iowa State College, Ames, Iowa.

STATISTICAL INFORMATION FOR JANUARY, 1932

GARDEN ATTENDANCE:

Total number of visitors	30,210

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	44
Total number of books and pamphlets donated	158

PLANT ACCESSIONS:

Total number of plants and seed packets donated	73

HERBARIUM ACCESSIONS:

By Purchase—	
Ciferri, R.—"Mycoflora Domingensis exsiccata," Cent. III.	120
Moore, J. A., and J. A. Steyermark—Plants of Texas and Wyoming	217
Weigel, Th. Oswald—"Eumycetes selecti exsiccati" Fasc. XX-XXI, Nos. 476-525, inclusive	50
By Gift—	
Deam, C. C.—Apocynaceae	10
Field Museum of Natural History—Lichens of Panama	5
Field Museum of Natural History—Photograph of *Gynoxis Poeppigii* DC.	1
Greenman, J. M.—Plants of Louisiana	8
Sinclair, John F.—*Cestrum diurnum* L. from Texas	1
By Exchange—	
Ewan, Joseph—Plants of California	40
Farlow Herbarium, Harvard University—Algae	16
By Transfer—	
Beilmann, A. P.—Plants of horticulture	4
By Field Work—	
Dodge, C. W.—Plants of Louisiana	20
Total	492

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlia (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

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Director

KATHERINE H. LEIGH,
Assistant to the Director

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Pathologist

CARROLL W. DODGE,
Mycologist

JESSE M. GREENMAN,
Curator of Herbarium

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A. D. FORRESTER,
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TROPICAL STATION, BALBOA, CANAL ZONE

A. A. HUNTER,
Manager

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

Vol. XX MARCH, 1932 No. 3

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Floral Displays of Special Interest in 1932

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OF THE MISSOURI BOTANICAL GARDEN

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DANIEL BRECK, Secretary

(1)
EUPHORBIA LACTEA VAR. CRISTATA

(2)
CUTTING OF EUPHORBIA LACTEA
VAR. CRISTATA

Missouri Botanical
Garden Bulletin

Vol. XX MARCH, 1932 No. 3

DOUBLE PLANTS

It is well known that in many instances the perpetuation of desirable horticultural plants can not be accomplished by seeding but must be by grafting. In grafting, a portion of the plant to be propagated, the cion, is placed upon another individual, the stock, which usually is less desirable. Care must be taken that the freshly cut surfaces of stock and cion are closely contacted and the graft protected from desiccation by a coating of wax or a covering of dampened moss. Certain cells of both the cut surfaces multiply rapidly until there is formed a zone of irregular cells, the callus tissue, which mechanically unites the stock and cion and provides a temporary passageway for nutrient materials between stock and cion. A permanent conducting system may later be formed. Under ordinary circumstances this mechanical union of stock and cion at the callus region is all that ever occurs, the cion maturing into the likeness of its parent, of which it is but a part.

Yet sometimes forms of an exceedingly puzzling nature have materialized as a consequence of grafting. In 1825, a French horticulturalist named Adam grafted cions of *Cytisus purpureus,* a purple-flowered plant closely related to the Scotch broom, upon *Laburnum vulgare,* the common laburnum which bears yellow flowers. He produced more than he had bargained for, because to his amazement this sup-

posedly successful grafted plant of Cytisus occasionally produced reversionary shoots bearing the leaves and flowers of Laburnum, as well as developing the expected purple flowers. This new creation with the characters of both plants seemed certainly to warrant a name and was called *Cytisus Adami*, after the originator.

Through grafting of the medlar (*Mespilus germanica*) upon hawthorn (*Crataegus monogyna*) two types of plants were originated which differed from the parent stock and seemed to combine the characters of the two plants.

These forms were for a long time designated as "graft-hybrids," but a later examination of them has shown that more accurately they should be known as chimaeras. The chimaera of Grecian mythology was a composite of lion, goat, and dragon, and a plant chimaera is truly a composite, being part cion, part stock.

Cytisus Adami, that protean shrub which could bear both purple and yellow flowers on different shoots, is in its heredity not one plant but a two-in-one plant. For some reason the primordial growing region from which the shoots of *Cytisus Adami* arose was formed in the region of union between the cion and the stock. The outer cells forming this primitive bud were cells from *Cytisus purpureus* (the cion) and the inner cells were from *Laburnum vulgare* (the stock). As the bud developed these two kinds of growing cells maintained their hereditary individuality even though growing almost homogeneously together. The complete outer layer of cells from *Cytisus purpureus* maintained their own individuality and determined the outward appearance of the branch, oblivious to the core of Laburnum cells which composed the central portion of the stem. Sometimes the inner Laburnum cells accidentally were brought to the surface and asserted themselves by developing into branches of true Laburnum.

In the case of the Crataegus-Mespilus chimaera, development probably proceeds as in *Cytisus Adami*, but the two different forms are determined by the outer layer of tissue. If Mespilus tissue is outside, the plants are of one kind; if Crataegus is outside, they are somewhat different.

Such plant mixtures in which the tissue of one plant envelops the other completely are called "periclinal chimaeras." There are also a few cases in which a sector of the tissue of the stock unites with that of the cion. The latter are designated as "sectorial chimaeras" and evince their differences readily.

These double-natured plants have been deliberately created and studied by several botanists. Most interesting are the results obtained from grafting black nightshade (*Solanum nigrum*) and tomato (*Solanum lycopersicum*). Stock and cion were united by a cleft graft, and when they had grown together the graft was cut across at the middle. From the callus formed by both tissues new shoots were developed. Those developing along the line of union of stock and cion showed quite different development when studied carefully. The shape and size of the leaves, the size and color of the flower, the size, shape, and color of the fruit were dependent upon the number of the cell layers comprising the outer tissues of either plant. Even though some of these chimaeras differed externally so much from their ancestors that they were originally considered new species, from seed they would produce only tomato or only nightshade, never both and never any intermediates.

There is in the cactus and succulent house at the Garden an ill-begotten variety of *Euphorbia lactea,* remarkable for the irregularity and asymmetry in its growth (pl. 15, fig. 1). This unbelievably asymmetrical, uncouth plant, which would be quite at home in Alice's Wonderland, really originally came from the austerely symmetrical, sleek *Euphorbia lactea* (pl. 15, fig. 2) by some aberration of growth. Evidently this aberration did not affect the internal layers of the plant, because cuttings from the bizarre aberrant forms sometimes produce beautiful symmetrical shoots exactly like the original parent, as well as continue their irregular growth. The plant with the reversionary shoots was derived from a cutting of the irregularly formed plant. This, then, may well be another kind of periclinal chimaera which has not originated as the illegitimate progeny of graftage, but through some slip-up in the growing point of the plant where the determining factor for symmetry was lost from the outer layer of

cells. That it remains still within the central cells is easily seen in the new symmetrical shoots which in all probability have their origin in an unaffected deep-seated growing layer.

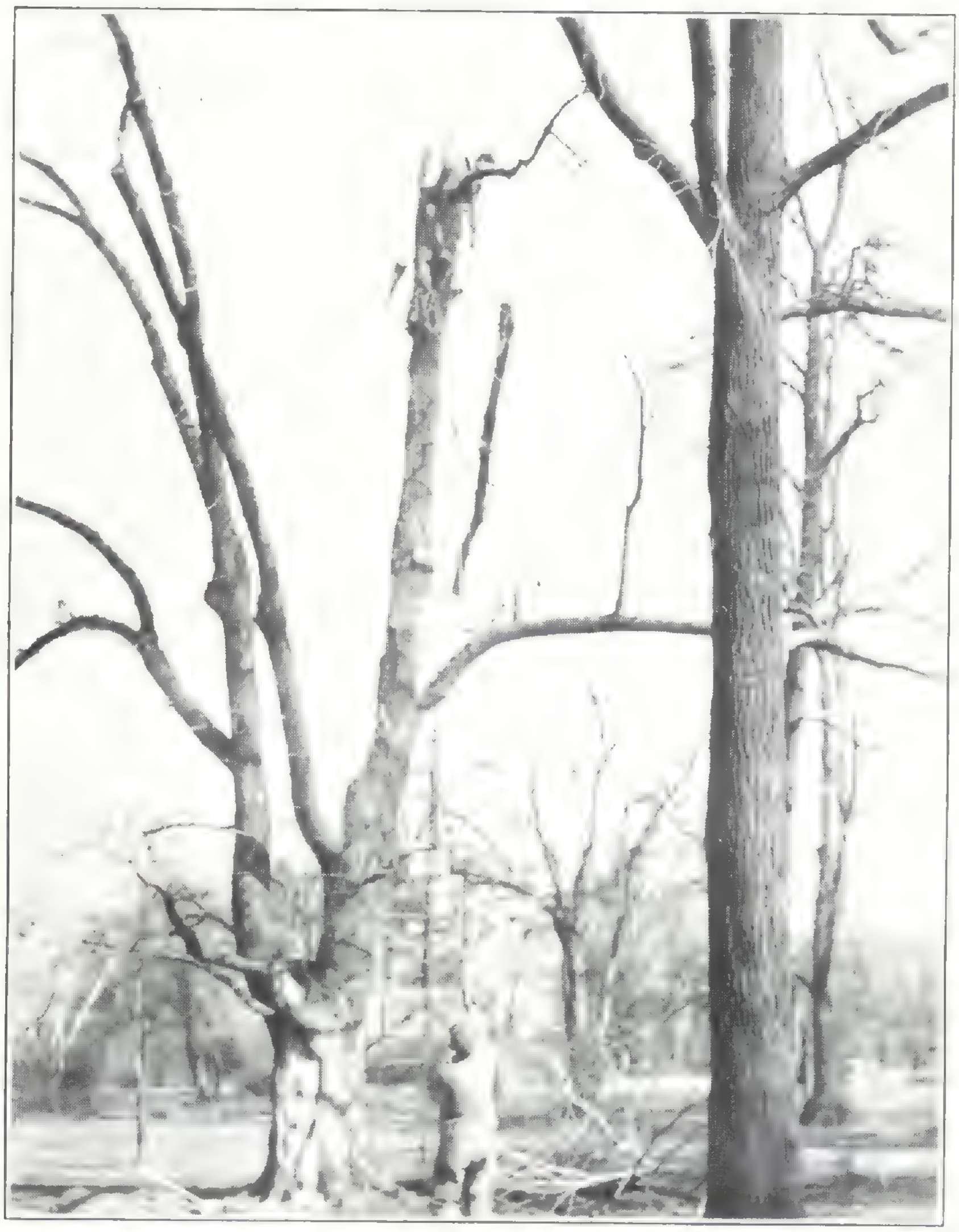
JOHN ADAM MOORE

OLD TREES IN THE GARDEN

The questions frequently arise regarding the age of the largest tree in "Shaw's Garden," and if any tree now standing dates back to a time previous to Mr. Shaw's acquisition of this land. Since it has been necessary during the past two years to remove two of the oldest trees in the Garden, it can now be said that, with possibly one exception, no large tree is now living which was not planted by Mr. Shaw. The exception is a pin oak (*Quercus palustris*) directly in front of the floral display house, which has a circumference of 7 feet 9 inches. A pin oak outside the Garden, recently examined by the writer, proved to be 106 years old. This tree was more favorably located but was only four inches greater in diameter than the Garden specimen.

Theoretically, there is no age limit for a tree, for the growing region is constantly being renewed. It may be as "young" to-day as it was one hundred years ago. However, many things bring about its decline: changing conditions of soil, moisture, and of food, and the removal of companions which furnished shelter. There are few large trees in this region whose trunks and limbs fail to show the ravages of disease and insects, high winds, or the weight of snow. Because so many factors combine against them, it is inevitable that eventually they will succumb and have to be removed.

Directly east of the Old Residence a lone specimen of the honey-locust (*Gleditsia triacanthos*) has been a witness for fully 110 years to the growth of the city and the development of the smoke problem. Last year it was deemed advisable to remove this tree in the interest of safety. Nothing remained of the top but one broken limb. The trunk measured 13 feet 8 inches in circumference, but since only a 6-inch shell of this was undecayed only a rough estimate of



REMOVAL OF 80-YEAR-OLD ENGLISH ELM

Scars on trunk result of lightning

TRUNK OF ENGLISH ELM 80 YEARS OLD

ROOTS OF ENGLISH ELM SHOWING DECAYED CENTER AND FEW REMAINING SURFACE ROOTS

the age of the tree could be made. No record exists of the date of planting, and from this fact and that of its great size we may assume that the tree was on the Garden property when Henry Shaw acquired it.

In February of this year an eighty-year-old English elm (*Ulmus campestris*) was removed to prevent the damage its fall would have caused. Since its age was exactly that of the Old Residence, it must have been planted by Mr. Shaw shortly after he began developing the Garden. The story of its removal is well told in the accompanying photographs. Each limb was lowered (pl. 16) until only the short trunk remained. Nothing was left of the once extensive root system except the few surface roots shown in pl. 17. The trunk measured 8 feet 4 inches in length and 8 feet 6 inches in circumference (pl. 17). It is interesting to note that the log weighed 3,050 pounds and would have weighed 5,000 pounds had it been sound. Two limbs 6 feet 7 inches long and 18 inches in diameter weighed 2,700 pounds. According to the studies of forest botanists, the formation of the trunk of this tree may have required the use of over one million gallons of water. The rate of increment varied greatly. From about the age of thirty years one inch was added to the diameter annually for many years. Later this was reduced to one-half inch, while the last twelve years combined added only slightly more than one inch.

A. P. B.

ADVENTITIOUS ROOTS FROM GINKGO LEAVES

The ability of different parts of a plant to form adventitious or "emergency" roots is the basis of propagation by cuttings. Pieces of branches are usually used to develop roots and obviously the growth is of a different type from that which they are accustomed to form. Occasionally a plant reacts in a singular manner, as in the case of *Ginkgo biloba* (pl. 18). Leaves were stripped from a ginkgo tree in June and placed in a propagating bench. After four weeks they had formed roots, which was rather surprising, since there was no woody "heel" left attached to the base of the leaf petiole. These rooted leaves were then potted

and remained alive for another three weeks, but gradually died without having formed any new aerial shoots. The absence of a woody portion of the plant of course accounts for the inability of the leaves to develop new shoots above ground. It would seem as if all growth and reproductive capacity were spent in the formation of roots and that none was left to form an adventitious bud to complete this heroic attempt at vegetative propagation.

A. P. B.

SEED AND NURSERY CATALOGUE COLLECTION AT THE MISSOURI BOTANICAL GARDEN

There are many species of the bibliomaniac, but if one belongs to the variety with the seed-catalogue complex he would fairly revel in the collection at the Missouri Botanical Garden. The American collection is considered to be one of the most complete in this country, extending over a period of half a century or more and consisting of about 5,000 pamphlets. In 1903 Peter Barr presented the library with a great number of old catalogues, many of them as far back as 1867, and the United States Department of Agriculture and Wm. Tracy, Jr., have also sent some from time to time. It would be too great a task to list the nursery- and seed-firms represented, but in addition to the American collection there is a fair representation from all over the world, England, Holland, Germany, France, Africa, and India. In the last few years the Garden's representative in Europe, Mr. Gurney Wilson, has sent quite a number of old English catalogues of the firms of Bull, Carter, Veitch, Sutton, and others.

The more serious-minded can find here a wealth of useful information. For example, recently a botanist wanted to obtain the history of a horticultural variety of cucurbit. After scouring the country and writing to the seed firms themselves he finally found most of the desired information in the earlier seed catalogues of Dreer and Henderson. A scientist in California, who is trying to learn to what extent Burbank introductions have become established commercially, especially in the fruit industry, found it necessary to

ADVENTITIOUS ROOTS FROM GINKGO LEAVES

call upon the Garden library for Burbank's early lists of introductions.

Aside from their usefulness, the charms of the catalogues are legion. An enthusiast need not wait for the "open season," but can find much pleasure in them throughout the year. From the crudely colored plates, such as those in B. K. Bliss & Son's Autumn Catalogue of 1867–68, where it is almost necessary to label the flowers because they are so poorly drawn and painted, have been developed the present glorious plates accurately done by a professional artist. The evolution in advertising is another field of interest. A firm whose trade-mark in 1897 was "Forget-me-not" pictured a lady of the gay nineties, with a huge pompadour and a tiny waist, holding a spray of stiff forget-me-nots. This is a far cry from the modern firm which uses humorous cartoons based on the season or the supply of stock.

Listed below are some of the firms whose catalogues antedate 1865:

FIRM	PLACE	DATE
C. Appelius	Erfurt, Germany	1846
A. & N. Baumann	Bollwiller & Mulhouse, France,	1842–3
E. Benary	Erfurt, Germany	1861
B. K. Bliss	New York, N. Y.	1859
Bloomington Nurseries	Bloomington, Ill.	1859
R. Buist	Philadelphia, Pa.	1855
Wm. Bull	London, England	1861
J. Carter	London, England	1846–7
F. Cels	Paris, France	1861
G. Clisby & Co.	Holland	1834
J. S. Cook	Cincinnati, Ohio	1860
C. Deegen	Altenburg, Germany	1857
J. M. Dippe	Quedlinburg, Germany	1848–9
John Donnellan & Co.	Rochester, N. Y.	1857
Ellwanger & Barry	Rochester, N. Y.	1860
G. Geitner	Planitz, Austria	1861
G. Gleichmann	Erfurt, Germany	1857
F. Grage	Hamburg, Germany	1848
C. Grundel	Offenbach, Germany	1864
F. Haage, Jr.	Erfurt, Germany	1857
Harkett's	Dubuque, Iowa	1876
H. v. Heinemann	Erfurt, Germany	1861
E. G. Henderson	London, England	1860
A. Hvass	Stuttgart, Germany	1858
G. A. Jacobi	Cöln, Germany	1855
K. König	Colmar, Germany	1864

FIRM	PLACE	DATE
C. Kunicke	Wernigerode, Germany	1856
Loddiges & Sons	London, England	1818
Loise	Paris, France	1864
Peter Mackenzie	Philadelphia, Pa.	1861
H. Mette	Quedlinburg, Germany	1852
R. Mettler	Hamburg, Germany	1848
J. W. Michel	St. Louis, Mo.	1861
M. Müller	Strasbourg, France	1859
A. Papeleu	Ledeberg, Belgium	1856
A. Paul & Son	Waltham Cross, London, Eng.	1858
W. R. Prince & Co.	Flushing, N. Y.	1857–8
N. Riehl	St. Louis, Mo.	1849–50
Roezl & Cie	Paris, France	1858–9
J. Salter	London, England	1864–5
C. B. Saunders	Jersey, Channel Islands	1861
C. Schickler	Stuttgart, Germany	1858
J. L. Schiebler & Son	Celle, Germany	1857
J. C. Schmidt	Erfurt, Germany	1849
F. Sencke	Leipzig, Germany	1857
A. Singer	Weissenfels, Germany	1856
P. Smith & Co.	Hamburg, Germany	1861
R. Smith	Worcester, England	1864
W. T. & E. Smith	Rochester, N. Y.	1857
Smith & Simons	Glasgow, Scotland	1863
A. Thranhart	Naumburg, Germany	1858
C. Turner	Slough, England	1851
A. Van Andel	Hamburg, Germany	1847–8
L. Van Houtte	Ghent, Belgium	1856
Vilmorin & Andrieux & Cie.	Paris, France	1855
B. M. Watson	Plymouth, Mass.	1860

E. M.

NOTES

On its biennial inspection trip to St. Louis libraries and institutions the University of Illinois Library School will visit the Garden library, March 24.

Mr. G. H. Pring, Superintendent of the Garden, spoke before the science department of the Normandy High School, March 9, on "Plant Exploration in the Andes."

Dr. H. S. Pepoon and Mr. E. G. Barrett are spending some time in the Garden herbarium checking over Illinois plants in connection with a project of the State Natural History Survey of Illinois.

The February number of "Missouri," the official publication of the Missouri State Chamber of Commerce, contained an article by Mr. L. P. Jensen, Manager Gray Summit Extension, entitled "Shaw's Garden Outgrows Its Borders."

Dr. George T. Moore, Director of the Garden, spoke before the Executives Club of St. Louis, at the Hotel Statler, February 23, on "Advertising St. Louis with Flowers;" and before the Engineers Club of Kansas City, March 7, on "Movement in Plants."

Mr. G. H. Pring, Superintendent of the Garden, gave a radio talk over Station KWK, March 1, on "Spring Work in the Garden;" and Mr. Paul A. Kohl, Floriculturist to the Garden, spoke over the same station, March 15, on "Annuals and Perennials."

Among those visiting the Garden recently were Mr. T. H. Frison, Chief Illinois Natural History Survey; Mr. John C. Wister, President American Iris Society; and Mr. Charles F. Swingle, Associate Pomologist, Division of Horticulture, United States Department of Agriculture.

Mr. L. P. Jensen, Manager Gray Summit Extension of the Garden, gave a talk illustrated with lantern slides to the Eureka Beautification Club, Eureka, Mo., February 19, on "How to Plan and Plant Your Yard;" and on March 1 he spoke before the Greater St. Louis Association of Gardeners at the Knights of Pythias Hall, Kirkwood, Mo., on "The Gardener's Interest in Roadside Planting."

The annual exhibit of the St. Louis Flower Show Association was held in the floral display house at the Garden, March 10–13. The exhibits included potted plants, cut flowers, and floral arrangements, such as table decorations, wedding bouquets, etc. All the exhibitors were from St. Louis and vicinity with two exceptions: Boyd Bros. and Henry Kraake, New Orleans firms, which sent a display of fancy-leaved caladiums; and Bauer-Steinkamp & Co., who exhibited a new red carnation. The house was open from 8 o'clock in the morning until 9 o'clock at night, and the total number of visitors for the three days was 12,695. The show was particularly crowded on Sunday, when 8,000 persons passed through the house between 2 and 5 o'clock in the afternoon.

STATISTICAL INFORMATION FOR FEBRUARY, 1932

GARDEN ATTENDANCE:

Total number of visitors	16,697

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	45
Total number of books and pamphlets donated	82

PLANT ACCESSIONS:

Total number of plants, bulbs, and seed packets donated	882

HERBARIUM ACCESSIONS:

By Purchase—

Arnold Arboretum, Harvard University—Plants of the United States collected by E. J. Palmer in 1930–1931	799
Broadway, W. E.—Plants of Trinidad, British West Indies	125
Bush, B. F.—Plants of Missouri	75
Lundell, C. L.—Plants of Yucatan, Mexico	108
Sharp, Ward M.—Plants of West Virginia	50
Williams, Louis—Plants of Wyoming	105

By Gift—

Barkley, Fred A.—Plants of Oklahoma	8
Foreau, G.—*Exobasidium* from southern India	1
Goodman, George J.—Plants of Utah	45
Pfeiffer, Dr. Norma E.—Photographs of *Isoetes*	3
Rambo, B.—Lichens from Brazil	100
Sharp, Ward M.—Plants of West Virginia	13
Suppan, Prof. Leo—Plants of the Philippine Islands	175
University of Hawaii by Dr. Harold St. John—Plants of Hawaii	2

By Exchange—

California Academy of Sciences by J. T. Howell—Plants of Arizona, California, and Nevada	7
California Academy of Sciences by Miss Alice Eastwood—Plants of western United States and Mexico	218
Demaree, Prof. Delzie—Plants of Lubbock County, Texas	218
Masaryk University, Brno, Czechoslovakia—Plants of Czechoslovakia—Cent. VII, Nos. 601–700, inclusive	100
Riksmuseets, Botaniska Avdelning, Stockholm, Sweden—Plants of Sweden	300
University of Minnesota by Dr. C. O. Rosendahl—Plants of Itasca Park, Minnesota	99

By Field Work—

Dodge, Dr. C. W.—Plants of Missouri	10
LaGarde, Dr. R. V.—*Tulostoma* from Missouri	1
Total	2,562

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

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Missouri Botanical Garden Bulletin

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Floral Displays of Special Interest in 1932

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OF THE MISSOURI BOTANICAL GARDEN

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ARISTOLOCHIA INDICA

Left: portion of plant; right: part of woody stem presented to Mr. Parish by the Rajah Hari Singh

Missouri Botanical Garden Bulletin

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SNAKE-BITES AND "DUTCHMAN'S PIPE"

The healing properties of plants have been recognized from earliest times. In ancient Greece the "rhizotomoi," or root-diggers, and the "pharmacotogai," or drug-sellers, carried on a considerable trade in medicinal plants. Naturally, there gradually developed a tradition about various vegetable products which ascribed to them miraculous powers. Even to this day, much of this folklore persists, there being many (not among the medical profession, however) who stoutly maintain that this plant or that plant is a "cure" for this or that complaint. Very, very rarely legends respecting the curative property of some plant are later proven to be true. Such was the case with chaulmoogra oil. Buddhist histories of a thousand years ago contained an account of a king of Burma who cured himself of leprosy with the oil from the tree "kalaw" (MISSOURI BOTANICAL GARDEN BULLETIN, September, 1921). Likewise the early accounts of the use of the powdered bark of the cinchona tree as a cure for fever were regarded with more or less contempt, leading physicians denying the efficiency of quinine as late as the middle of the last century.

In countries where poisonous snakes abound there has been for hundreds of years a well-established belief that a sure antidote for bites from these reptiles was to be found in a certain plant. Oddly enough, unlike the usual hetero-

geneous lot of herbs, all regarded as being "good" for a certain disease, the cure for snake-bite is universally confined to a single genus, Aristolochia, or "Dutchman's pipe," the species varying with the particular region of which it is native, or where it commonly occurs. Thus in North America it is *Aristolochia Serpentaria,* "Virginia snakeroot," or *A. reticulata,* "Texas snakeroot." In South America it is *A. maxima* or *A. cymbifera,* which is carried by the Indians who travel over the country. In Arabia *A. sempervirens* is used as a counter-poison, as is *A. anguicida* in the Antilles. It is reported that this latter species is used by Egyptian jugglers to stupefy snakes before handling them, and if the juice of *A. anguicida* be swallowed by a serpent it will die in convulsions.

It is in India, however, that, because of the prevalence of fatal bites from snakes, the legendary history of cures from the use of *Aristolochia indica* (plate 19) has received the most attention. Routledge's "Illustrated Natural History," quoted in the "Gardeners' Chronicle" for 1862, pp. 95–96, gives a rather full account of specific uses of this plant and in view of more recent accounts it seems worth while quoting in full:

Aristolochia indica an Antidote to Snake's Venom.—"According to your request, I have the pleasure of inclosing a statement of one out of at least twenty cases of snake-bites, in which the exhibition of the *Aristolochia indica* was attended with complete success, on patients who were brought to my house on a litter, in a perfect state of coma from the bites of venomous snakes. The *Aristolochia indica* is noticed by medical writers as a powerful stimulant, much extolled as a remedy for snake-bites, in support of which I need only refer you to my detailed statement, as also to the circumstances under which the plant was transferred to my garden at Allahabad. The gentleman from whom I received it (Mr. Breton, Deputy Collector of Customs) gave me the following account of it: A cobra, to the great alarm of his servants, had taken up its abode in a mound of earth, formed by white ants, in the vicinity of his house. A party of snake-catchers having one day made their appearance in the village, Mr. Breton was afforded the opportunity of getting rid of the reptile by having it dug out of its lodgment. After having reached a considerable depth, the man at work used his finger for the purpose of ascertaining the direction of the hole. This seemed to have been its termination, or nearly so, as the snake caught hold of his finger. His companion immediately ran off to the bank of a stream near at hand and brought

back some leaves, which, having bruised with a stone, he administered to his friend's relief. Mr. Breton requested the man to take him to the plant, which he forthwith removed to his own garden. The snake-catcher informed me the plant was a specific, and that they usually carried the dried root about with them in case of need. Mr. Breton, having been subsequently appointed to Allahabad, brought the plant away, and was successful in the treatment of numerous cases. On being removed to a distant station, he transferred the plant to me. The plant is a creeper, and sheds its leaves at that season when snakes, for the most part, are lying inert in their holes. I should have mentioned that the cobra above referred to was killed in the hole. There are several species of Aristolochia, all of them, I believe, stimulant; but the *indica* is that which I refer to. It is intensely bitter and strongly aromatic. In one bad case which came under my treatment, in which large doses had been exhibited, I gave an additional leaf to the patient to take home, but to be used only in case of relapse. Her husband informed me that, although quite recovered, she took the extra dose at 1 o'clock in the morning, and became so giddy that in attempting to move she reeled about like a drunken creature. A young Hindoo woman was brought to my door in a 'charpoy,' or litter, in a state so apparently lifeless from a snake-bite, that I had no hesitation in refusing to prescribe. An officer, who was on a visit at my house at the time, considered the woman beyond the power of human relief, and advised me to send her away, as my failure would bring discredit on a remedy which was attracting public notice. In this instance the patient was as cold as marble; there was no pulsation; countenance death-like. The woman's husband manifested great distress at my refusal, at the same time urging that as the remedy had been prepared, I might, at any rate, give his wife the chance of recovery. I explained to him my motives, and my firm belief that his wife was dead long before he had reached my door. However, rather than add to his distress by persisting in my refusal, I forced her jaws open, and poured down her throat three medium-sized leaves of the *Aristolochia indica*, reduced to a pulp, with 10 black Peppercorns, diluted with a graduated ounce of water. The remedy having flowed into her stomach, I directed her body to be raised and supported in a sitting posture, and with some anxiety, though without the slightest prospect of success. I attentively watched her features, and in the course of 8 or 10 minutes I observed a slight pulsation on her under lip. I instantly directed her husband, with the aid of my own servants, to drag her about for the purpose, if possible, of increasing the circulation. Supported by two men, holding her up by the waist and arms, she was moved about, her feet helplessly dragging after her. After a lapse of a few minutes, I perceived an attempt on the part of the patient to use her feet. I accordingly directed them to raise her body sufficiently high to admit of the soles of her feet being placed on a level with the ground. In

a few minutes she gave a deep inspiration, accompanied with a kind of shriek, manifesting the return of consciousness. This was followed by an exclamation, 'A fire is consuming my vitals!' At this time her chest and arms were deadly cold. I immediately gave her the pulp of one leaf in an ounce of water, which greatly alleviated the burning sensation in the stomach. She was then enabled to explain the position of the wound on her instep, which had the appearance of a small speck of ink, surrounded by a light-coloured circle. I had the part well rubbed with the Aristolochia, after which she was able to walk without assistance. I kept her walking up and down for at least a couple of hours. Having expressed herself entirely recovered, I allowed her to depart. She called on the following morning to show herself. The snake, unfortunately, escaped, but the woman described it as a 'kala samp,' which is the term ordinarily used for the kobra kapelle. I have written the above entirely from memory, the case having occurred eight or nine years ago. A middle-aged woman was brought to my door in the early part of the rainy season, who had been bitten by a snake at daybreak, while stooping down for the purpose of sweeping the floor. She called out to the people of the house that a rat had bitten her, and nothing more was thought of it, as her attention was directed to her infant, who became fractious for the breast. She accordingly went to bed to give the child sustenance, and not long afterwards complained of giddiness. It was suggested to her that a snake might have bitten her, but she referred to a hole in the mud wall from which the rat must have darted out. Nothing further transpired until the household were alarmed on finding her in a state of insensibility, foaming at the mouth, and the infant at her breast. They were then convinced that a snake must have done the mischief, and immediately carried her off to the charmer! After detaining the woman for a full hour, the fellow coolly told her friends to take her off to the Commissioner, who would prescribe for her. The poor woman had been dead for some time before the incantations were finished. On arriving at my house, I found the deceased in a state of incipient decomposition, and, having heard the statement of her friends, directed them to take the body away for the performance of funeral rites, and to lose no time in bringing her infant, who was said to be suffering from the effects of the poison. The poor thing reached my house in a state of insensibility, though not dead. Its head was hanging on its shoulder, and when raised beyond the perpendicular would fall on the opposite shoulder. The body was not cold, and that was the only indication that death had not supervened. I selected one of the smallest of the leaves of the Aristolochia, and pounded one-third of it, and with a small tablespoonful of water, poured the solution into the stomach. After the lapse of four or five minutes the child heaved a deep sigh, opened its eyes wildly, gave a loud scream, and afterwards became quite composed. The child was brought to me next morning quite well."

LONG-TAILED LADY'S SLIPPER

Phragmopedilum caudatum var. *Warscewiczianum*

BRAUNERIA ANGUSTIFOLIA
GROWING AT GRAY SUMMIT EXTENSION

FLOWERING HEADS OF BRAUNERIA
ANGUSTIFOLIA

Even more interesting is the letter received some time ago by Dr. Borden Veeder from Mr. Neville B. Parish, of Bromley, Kent, England. Accompanying the letter was the "little bit of wood" (plate 19, right figure) which proves to be a part of the woody stem of *Aristolochia indica.*

"The story of the little bit of wood I enclose is as follows:

"In the heart of the Bikaner desert there is a large tract of arid country, which is ruled over by a very fine old Rajput Chief, The Rajah Hari Singh of Mahajan. He is a man above the average in intellect, and is well educated and read.

"I was fortunate in being of service to him in a matter of sinking convoluted tubes in his main well and so greatly increasing the yield of water, which meant being able to save a great many more cattle and sheep during the dry season. He was extremely grateful and wished to give me some fitting present as a token of his gratitude. The presentation took the form of the little bit of wood, which he looked upon as one of his most treasured possessions, and the following is the story he told me in respect to it:

"As a young man he was a friend of the late Maharajah of Jaipur and was constantly at the court of that ruler. Jaipur is one of the oldest Rajput States in India and the late Maharajah was a very fine old orthodox Hindu. Close to the present city of Jaipur is the ancient capital, a wonderful old citadel with a group of very old temples perched amongst the hills, and is called Amba.

"While at Jaipur, Rajah Hari Singh became a student of Hindu mythology and studied under the Guru or High Priest of these old temples and became a favourite pupil of this very holy and revered teacher.

"At some time or other he heard of a wonderful shrub or creeper, which grew in the sacred gardens of the temples, and which was supposed to grow in no other place in all India. This shrub or creeper was tended by the priests and was the property of the Guru. It was credited with wonderful properties and bits were given on rare occasions as a particular token of esteem by the Guru to very devout Hindus. The lesser priests, I believe, also derived a pretty large source of income from surreptitiously selling small bits to their flock.

"Rajah Hari Singh tried to get the Guru to give him a bit of this wood, but for a long while was unsuccessful and only succeeded when he was leaving Jaipur to return to his native land, when the old Guru knew they would in all probability never meet again.

"Amongst other things the wood is supposed to be a certain cure for all sorts of snake bite, and I think the fact that Rajah Hari Singh knew how interested I was in snakes and that I had been for some time trying to trace a particular snake, which tradition says lives in the desert and kills shepherds, while they are asleep, in a very peculiar way, made him give it to me.

"I questioned him very carefully as to the practical use he had put the wood to, and he gave me the following three cases in which he said he had unquestionably saved the lives of people with it:

"The first was of a woman, who had stepped on a snake and had been bitten on the ankle. She was brought to him when unconscious and her leg terribly swollen, and seemed to all intents and purposes dead. She was treated with the 'snake charm,' and recovered. The snake was supposed to have been a krait.

"The second was of a servant of Rajah Hari Singh, who, when collecting wood, was bitten on the hand. His arm at once began to swell and he became torpid and commenced to vomit. He was also treated and soon recovered. It seems that this snake was not killed, but seen, and was also credited with being a krait.

"The third was of an old retainer, who was an enormous opium eater. This man, who was nearly seventy, consumed enough opium every day to kill any ordinary person, and he was one of the show turns at the Rajah's fort. The Rajah would call the old man up and he would give him enough opium in front of you to drug a dozen people. He would take it, squat in front of you, and consume the lot with great relish, and after an hour or so would seem only very drowsy and fuddled. This old man, on the celebration of a wedding, got hold of a great supply of opium which had been meant for all the servants, and consumed the lot before any one spotted what he was up to. This proved too much for him and there seemed little chance of saving him; in fact, a native doctor swore nothing could. The Rajah, who was very fond of the old man, thought of his 'charm,' and treated him with it. In a few hours the old man was sitting up, looking round to see if he could not pinch some more opium.

"When one has lived for any time in the East, one becomes very careful as to what one believes in the way of this sort of story, and unless there is concrete proof one is inclined to treat it as a mere legend. I am convinced, however, that what the Rajah told me he absolutely believed to be true.

"Now the native's temperament is such that he makes a perfect subject for 'faith healing.' There are many cases on record where villagers have been brought into hospital suffering from snake bite, and have developed symptoms and died just as if they had been bitten by a poisonous snake, and yet the snake had been killed and brought in with them and undoubtedly classified as a perfectly harmless species. I see no reason, therefore, if a person can so frighten himself to death, that, given an equally reassuring antidote, he should not persuade himself into getting well. In this case, against this argument are the cases of two of the three people being unconscious when being treated, and so, unless the wood had some sort of property to make them regain consciousness, I don't see how they could think they were going to be cured.

"The way it is used is: a piece of the wood is pounded into a powder and then mixed with a little water. The patient is made to swallow some and the remainder is rubbed into the bite."

While the various species of Aristolochia have never been recognized officially as being useful in counteracting the poison of snakes, some of the constituents of these plants have been used in medicine for a long time. Both *Aristolochia Serpentaria* and *A. reticulata* are officinal in the United States Pharmacopoeia, and there seems to be no question about the physiological action of the drug in certain cases. As an antidote for snake poison, while there is much direct testimony, such as has been quoted, there has never, so far as known, been a scientific investigation of the question, and it still remains to be proved whether or not Aristolochia has any real value in such cases.

LONG-TAILED LADY'S SLIPPER

The changing nomenclature of plants is sometimes compared by gardeners with the fickleness in fashions. The long-tailed lady's slipper is a good example. Since its introduction in 1840, it has been called *Cypripedium caudatum* Lind., *Selenipedium caudatum* Rchb., and finally *Phragmopedilum caudatum* Rolfe. Its various forms, which a collector will attribute to differences in environment, have been registered in the following varietal names: *Albertianum* Lind., *giganteum* Lind., *Lindenii* Veitch, *roseum* Lind., *Seegerianum* hort., *Wallisii* Veitch, and finally the variety illustrated, *Warscewiczianum*. It is little wonder that the local wholesale florist resorts to such adopted names as "Cypes" for Paphiopedilums or Phragmopedilums, "spray orchids" for Phalaenopsis, Cymbidiums, Odontoglossums, Oncidiums, and "Cats" for Cattleyas, Brassocattleyas, Brassolaeliocattleyas.

Dr. Lindley first described this species as *Cypripedium caudatum* in his "Genera and Species of Orchidaceous Plants," page 531, from fragmentary material in an herbarium left by Ruiz and Pavon of Peru, and preserved in Sir William Jackson Hooker's herbarium. Later the orchid collector, Lobb, who was sent to Peru by Messrs. Veitch, of Exeter, England, discovered the plants in the Andes, east of Lima, "in the far interior," and sent dried specimens to England. Mr. Lobb finally obtained living roots and brought

them as far as Jamaica, West Indies, where they perished during his illness with a malignant fever. Upon receipt of the dried material it was examined by Sir William Hooker, who states:

"From one of the two above-mentioned specimens, for which I am indebted to Mr. Veitch, the accompanying figure was made; but here again I have to regret the absence of foliage, so that I cannot be sure it has a scape like the species of northern India, or, as is most likely, a leafy stem like our European and the North American and other Mexican species. In the latter case, the species must be a stately one, for the upper portion, without the trace of a leaf, is more than a foot long, everywhere clothed with a compact ferruginous down except on the bracteas, the lip, and the inside of the petals and sepals. The lower of the bracteas is 2½ inches long, striated, broadly oval, very obtuse, folded double so as to embrace the pedicel and the main stalk; the upper ones are gradually smaller. There are three flowers, and a trace of a fourth, larger than those of any known species, the structure of which will be better seen by the figure than any description in words."

Phragmopedilum caudatum was later discovered by the collector Hartweg, near the hamlet of Nanegar, in the province of Quito. However, living specimens were not sent to Europe, and collectors for Messrs. Veitch and Mr. Linden are given credit for its successful introduction there. It was first flowered and exhibited before the Royal Horticultural Society by Mrs. Lawrence, of Ealing Park, London. According to Hartweg and later Warscewicz, the plants were discovered in "native swamps." The writer's experience in Panama ("Collecting Orchids in the Chiriqui." Mo. Bot. Gard. Bull., May, 1927) was quite the contrary. Here, after considerable difficulty, a few plants were finally discovered in the region of Palo Alto, at an elevation of 5,000 feet, growing upon the upper branches of giant forest trees. Fortunately for the collectors, the trees had been felled, a common practice in preparation for a coffee finca. Other orchids upon the same trees were Maxillarias, Ornithidiums, Stanhopeas, Epidendrums, Warscewiczellas, Trichopilias, and *Odontoglossum Powellii*.

Three weeks later plants were found near the Volcan region, bordering Costa Rica, and after much bargaining were purchased from a native who had collected them from felled trees. The species would seem to be as rare as the

native *Cypripedium pubescens* in St. Louis County. During the many collecting trips of the late Mr. Powell, he never was successful in the search for the "long-tailed chinela." Occasionally a native thought that he could locate this species, but would always bring back the species *longifolium* instead. Mr. A. A. Hunter, who accompanied the writer on a collecting trip in 1927, was familiar with *Phragmopedilum longifolium,* having observed it growing in moist rocky ravines, associated with tree ferns, Philodendrons, etc. It would appear that this species was possibly mistaken for the epiphytic species *P. caudatum* by the early collectors. Many natives were questioned as to knowledge of the long-tailed chinela, with no result except for one man in the Volcan region who prized the plants almost as highly as he did the possession of the prize fighting cock of that region. A recent letter from Mr. Hunter says that he had succeeded in locating the "chinela" growing upon exposed rocks in El Valle. There was no mistake, since the plants are in bloom, but they have much darker-colored flowers and more succulent leaves than the typical form.

Difficulty is usually experienced in cultivating this variety. The plants evidently miss the daily precipitation of moisture in the form of very fine rain caused by the warm trade winds from the Atlantic Ocean, as well as the even day temperature and cool nights of their native habitat. Plants in the Missouri Botanical Garden Tropical Station, at Balboa, soon perish under the sea-level temperature. This holds true for many other genera which might be mentioned. The plant illustrated (plate 20) is the first to flower from those collected during 1927. The sepals are light yellowish green, four and one-half inches long by one inch wide. The petals are attenuated to a length of seventeen inches, yellowish green striped with brown, reddish brown toward the tips, the margins lined with minute reddish brown hairs. The lip, or labellum, is yellowish green shaded with brown; the introrse margin, or the incurved part of the pouch or slipper, is white spotted with purple. The bilobed staminodium and where it joins the column is spotted with bright reddish brown, forming a triangle of bright-colored spots. As soon

as the flower opens the attenuated petals elongate rapidly, growing as much as four inches in a day. The leaves are coriaceous, fan-shaped, ten or twelve inches long, one inch wide.

G. H. P.

THE PURPLE CONE-FLOWERS

The purple cone-flowers (Brauneria) are showy perennial herbs which are easily cultivated and improve considerably under cultivation. They are propagated either by division of clumps or by seed. *Brauneria purpurea* may be grown from seeds as easily as an annual, and, probably on account of its easy propagation, plants may be obtained from most nurserymen. *Brauneria angustifolia,* although the most common species in this locality, is rarely listed by dealers. This may be because the seeds will not germinate without stratification, or unless sown out of doors in late summer or early autumn, where they may benefit by the action of frost during winter. Experiments at the Gray Summit Extension have shown that seeds thus treated will germinate quite readily.

A limestone glade in late May or early June covered with hundreds of plants of the narrow-leaved purple cone-flowers is a sight not easily forgotten. The color of the flowers varies from the rarely pure white through magenta to dark reddish-purple. A succession of bloom for a period of three months may be obtained by planting the various species.

Brauneria purpurea (DC.) Britton (purple cone-flower or black Sampson).—Stems 2–3 feet high; lower leaves pointed, ovate, sharply toothed, rough, five-ribbed, the upper ones stemless and toothless; flower head conical, madder-purple, rays magenta or purple, rarely white, drooping.

Native habitat: in rich soil, in prairies and on banks. Distribution: Pennsylvania and Virginia to Michigan and Missouri, south to Texas; locally not abundant. Flowering period: July.

Brauneria angustifolia (DC.) Heller (narrow-leaved purple cone-flower).—Stems 1½–2 feet high; leaves lanceolate to linear-lanceolate, entire, three-nerved, rough; flowers similar to the preceding but with narrower rays.

Native habitat: on limestone barrens and dry slopes. Distribution: Illinois to Alabama, west to Minnesota and Nebraska, south to Texas; locally abundant. Flowering period: late May to July.

Brauneria pallida (Nutt.) Britton (pale purple coneflower).—Stems up to 3 feet high; rays very slender, otherwise similar to the preceding species.

Native habitat: on limestone barrens. Distribution: Illinois to Alabama, west to southwestern Missouri and Texas; not local. Period of bloom: May–June.

Brauneria paradoxa Norton.—Of similar habit to the two preceding species, but with nearly smooth, lance-linear leaves, and yellow rays.

Native habitat: prairies and barrens. Of limited distribution in southwestern Missouri and in Texas.

L. P. J.

WHITE GRUB WORMS IN BENT GRASS LAWNS

Last season lawns, as well as bedding plants, in the vicinity of St. Louis were greatly damaged by the white grub of one of the so-called "June-bugs." During the summer bent grass in the main garden began to show small brown areas which gradually increased in size until the only green patches left were those of white clover. The condition was at first thought to be the result of drought, but an examination revealed the presence of large white grubs, numbering as many as twenty-five or thirty to the square foot. The beetle deposits its eggs in the soil, the larvae from them hatching immediately below the turf. They are easily recognized as large curled white grubs with brown heads. Their legs are attached to the forward end of the body, enabling them to tunnel their way easily. They lie dormant in the winter, but in the spring immediately start feeding upon the growing roots and decaying vegetable matter. In two years the larvae develop into the light tan beetles which emerge from the ground during May or June. They may become objectionable at night when, attracted by a bright light, they fasten themselves by their claw-like legs upon persons or wire screens.

The pest has proved so troublesome on golf links that often, when constructing new greens, the soil is grub-proofed before sowing grass seeds or stolons. This is done by mixing five pounds of arsenate of lead with a cubic yard of soil, spreading the mixture over an area of 1,000 square feet, and thoroughly washing it in. After the sowing of seed the treatment must be repeated until the grubs are controlled. According to the reports of some greens-keepers chickweed showed a decided yellowing after the first application, and subsequent treatments finally controlled this annual weed. In treating established lawns the same method is used except that sand is substituted for soil in order to obtain a more even broadcast.

Poison bait may also be used as a control for the grub worm. One pound of white arsenic is mixed with ten pounds of wheat bran, the mixture moistened sufficiently to make it crumbly with a solution of one pint of molasses in ten pints of water. The bait should be scattered on the lawn in the evening, using three and one-half pounds to 1,000 square feet. Since the mixture will dry out during the day, the treatment should be repeated until the grubs are exterminated. Carbon bisulphide may likewise be used to advantage. One quart of commercial carbon bisulphide to fifty gallons of water is the usual formula, spread at the rate of three pints to the square foot. Another remedy recommended is sodium cyanide solution. Dissolve eight to ten ounces of sodium cyanide in fifty gallons of water, and use at the rate of two and one-half gallons of spray to the square yard of lawn, watering immediately afterwards. A yellowing of the grass will often result, but this is only temporary.

Attention should be called to the fact that carbon bisulphide is highly inflammable and that cyanide is a deadly poison. No one should attempt to use either without the utmost caution.

G. H. P.

NOTES

Mr. L. P. Jensen, Manager Gray Summit Extension, gave a talk before the members of the Glendale Garden Club, March 21, on "The Wild Flowers of Spring."

Dr. Carroll W. Dodge, Mycologist to the Garden, spoke before the bacteriological seminar at the Washington University Medical School, April 8, on "Pathogenic Yeasts."

Miss Rotha Bull, of the University of Oklahoma, and Miss Hazel M. Schmoll, of the University of Chicago, spent some time in the Garden herbarium recently, working on collections of plants.

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke at the University of Illinois, March 17, on "Experiences of a Timber Engineer"; and before the Engineers' Club of St. Louis, April 7, on "Termites."

Mr. L. P. Jensen, Manager Gray Summit Extension, is the author of an article in the March number of Parks and Recreation (Vol. XV, No. 7) on "Roadside Beautification in Missouri," and of one in the April number of Garden Life (Vol. V, No. 4) on "The Cultivated Phloxes."

Recent visitors to the Garden include Prof. H. W. Rickett, associate professor of botany, University of Missouri; Prof. A. G. Vestal, associate professor of botany, and Mr. O. T. Bonnett, instructor in botany, University of Illinois, accompanied by several of the students in botany from that institution.

Dr. George T. Moore, Director of the Garden, has given the following talks recently: March 20, radio talk in the Community Forum hour, over Station KMOX, on "The Easter Lily: Its History and Development"; April 4, before the garden clubs of Franklin County, on "Some Inside Facts about Plants"; April 8, before the Home Economics and Arts Club, at the Gatesworth Hotel, on "Morality in Plants."

Volume XIX, Number 1, of the ANNALS OF THE MISSOURI BOTANICAL GARDEN, has recently been issued and contains the following papers: "Plant Physiology as Sachs Found It," Ernest S. Reynolds; "The Contributions to Botany of Julius von Sachs," Charles F. Hottes; "A Half Century of Plant Physiology," D. T. MacDougal; "New or Otherwise Noteworthy Apocynaceae of Tropical America, II," Robert E. Woodson, Jr.; "A New Scapose Draba from Utah," George J. Goodman and C. Leo Hitchcock; "The Injurious Effects of Ultra-Violet and Infra-Red Radiations on Plants," Harry

J. Fuller; "A Revision of the Genus Menodora," Julian A. Steyermark.

Mr. George H. Pring, Superintendent of the Garden, has spoken before the following organizations recently: March 21, before the Missouri State Nurses' Organization, and March 28, before the Woman's Club of Belleville, Illinois, on "The Monthly Floral Displays at the Garden"; March 30, before the St. Louis Co-operative Club at the Hotel Statler, on "Spring Gardening"; April 5, before the Webster Groves Chapter of the Daughters of the American Revolution, "Colonial Gardens"; April 12, radio talk over Station KMOX, under the auspices of the Clean-up Campaign of the St. Louis Chamber of Commerce, "Clean up, Plant up St. Louis"; April 13, before the Town Club of St. Louis, at the Hotel Statler, "Wardian-Case Gardens."

STATISTICAL INFORMATION FOR MARCH, 1932

GARDEN ATTENDANCE:

Total number of visitors.....28,950

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	55
Total number of books and pamphlets donated.....	108

PLANT ACCESSIONS:

Total number of plants and seed packets donated.....	202

HERBARIUM ACCESSIONS:

By Purchase—

Broadway, W. E.—Plants of Trinidad.....	112
Lundell, C. L.—Plants of Campeche, Mexico.....	251
Lynge, Dr. B.—Lichens of northeastern Greenland.....	95
Natural History Museum, Paris—Photographs of types..	5
Verdoorn, Fr.—"Hepaticae Selectae et Criticae" Series III and IV, Nos. 101–200, incl.....	100
Verdoorn, Fr.—"Bryophyta Arduennae Exsiccata" Nos. 1–50, incl.....	50

By Gift—

Bull, Miss Rotha—Plants of Oklahoma.....	11
Bureau of Plant Industry, U. S. Department of Agriculture, by Dr. J. R. Cole—*Leptothyrium* sp.....	1
Dodge, Dr. C. W.—Plants of Costa Rica.....	3
Field Museum of Natural History—Plants of Costa Rica and Panama	5
Morse, E. E.—Plants of California and Washington.....	10
Moss, Dr. E. H.—Plants of Alberta.....	3

By Exchange—

Bouly de Lesdain, Maurice—Miscellaneous lichens.....	22
Farlow Herbarium—Thelephoraceae of Costa Rica, collected by Dr. C. W. Dodge.....	19

By Field Work—

Dodge, Dr. C. W.—Lichens of Missouri.....	12
Total.....	699

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

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Director

KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
Pathologist

CARROLL W. DODGE,
Mycologist

JESSE M. GREENMAN,
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Manager

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

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ST. LOUIS, MO.
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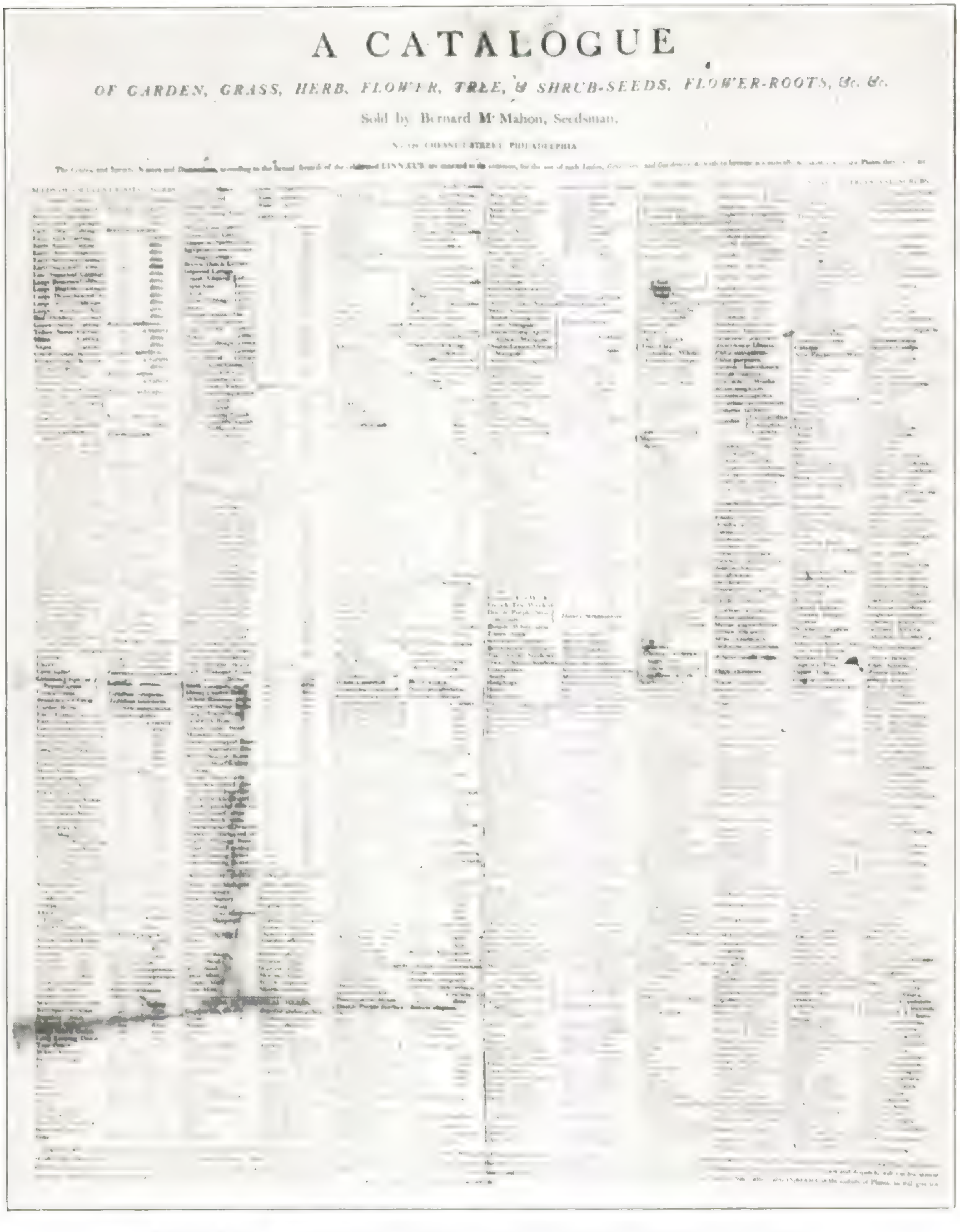

A CATALOGUE

OF GARDEN, GRASS, HERB, FLOWER, TREE, & SHRUB-SEEDS, FLOWER-ROOTS, &c. &c.

Sold by Bernard M'Mahon, Seedsman,

BERNARD M'MAHON'S SEED CATALOGUE ISSUED IN 1804.
THE ORIGINAL IS A "BROADSIDE," 18 x 22 INCHES

Missouri Botanical Garden Bulletin

Vol. XX MAY, 1932 No. 5

AN EARLY AMERICAN SEED LIST

Through the courtesy of Mr. Edward C. Vick, of Newark, New Jersey, the Garden has received a photostatic copy of one of the earliest seed lists ever published in the United States (pl. 22). David Landreth was the founder of the oldest seed house in America and probably published some sort of a catalogue before Bernard M'Mahon, but it could not long have antedated M'Mahon's list, which appeared in 1804.

M'Mahon has a peculiar interest for St. Louisans, since it is generally believed that the Lewis and Clark Expedition was planned at his house. Certainly he was one of those who took an active part in distributing the seed collected by these explorers. In 1806 M'Mahon published the first important work on horticulture which appeared in America, under the title "The American Gardener's Calendar; adapted to the climates and seasons of the United States; containing a complete account of all the work necessary to be done in the kitchen-garden, fruit-garden, orchard, vineyard, nursery, pleasure-grounds, flower-garden, greenhouse, hothouse, and forcing-frames, for every month in the year; with ample practical directions for performing the same," etc.

In a report of the committee appointed by the Pennsylvania Horticultural Society for visiting the nurseries and gardens in the vicinity of Philadelphia, dated July 13, 1830,

appears the following reference to a visit to "Mrs. M'Mahon's practical directions for performing the same."

"The establishment is nineteen years old, and was founded by that enterprising and distinguished horticulturist, Mr. Bernard M'Mahon, husband of the present proprietor. . . . A very large tree of *Maclura Aurantiaca*, or *Osage-orange*, a highly ornamental tree with bright green foliage and standing longer in the fall than any other of the deciduous tribe. It bears a large green fruit not unlike an orange. We think Mr. M. was the first to introduce this tree amongst us. . . . Mr. M'Mahon was an indefatigable arborist, and his garden now exhibits a row of native oaks, planted by him, containing thirty varieties, being all the kinds that he could collect in his day, either with money or zealous exertion. The willow-leaved oak is conspicuous and forms a very handsome conical tree. Perhaps we owe as much to the late Mr. M'Mahon as a horticulturist, as to any individual in America. Besides his efforts in collecting and propagating, we are indebted to him for his excellent book on American gardening which has passed through many editions."

Aside from the fact that M'Mahon was born in Ireland about 1775 and died in Philadelphia on September 16, 1816, practically all the information concerning him is contained in a "Brief Memoir of Bernard M'Mahon" which appeared in the eleventh edition of "The American Gardener's Calendar," published in 1857.

"Bernard M'Mahon was no common man. He sought the American shores from political motives, as is understood, but what these were has not been determined; most probably it was necessary to fly from the persecution of government. He found American gardening in its infancy, and immediately set himself vigorously to work to introduce a love of flowers and fruit. The writer well remembers his store, his garden, and greenhouses. The latter were situated near the Germantown turnpike, between Philadelphia and Nicetown, whence emanated the rarer flowers and novelties, such as could be collected in the early part of the present century, and where were performed, to the astonishment of the amateurs of that day, successful feats of horticulture that were but too rarely imitated.

"His store was in Second Street, below Market, on the east side. Many must still be alive who recollect its bulk window, ornamented with tulip-glasses, a large pumpkin, and a basket or two of bulbous roots; behind the counter officiated Mrs. M'Mahon, with some considerable Irish accent, but a most amiable and excellent disposition, and withal an able saleswoman. Mr. M'Mahon was also much in the store, putting up seeds for transmission to all parts of this country and Europe, writing his book or attending to his correspondence, and in one corner was a shelf containing a

few botanical or gardening books, for which there was then a very small demand; another contained the few garden implements, such as knives and trimming scissors; a barrel of peas, and a bag of seedling potatoes, an onion receptacle, a few chairs, and the room partly lined with drawers containing seeds, constituted the apparent stock in trade of what was one of the greatest seed stores then known in the Union, and where was transacted a considerable business for that day.

"Such a store would naturally attract the botanist as well as the gardener, and it was the frequent lounge of both classes, who ever found in the proprietors ready listeners as well as conversers; in the latter particular they were rather remarkable, and here you would see Nuttall, Baldwin, Darlington, and other scientific men, who sought information or were ready to impart it. Mr. M'Mahon was esteemed by these, and in several botanical works his knowledge is spoken of with great respect and consideration; Nuttall has named a much esteemed species after him, though by omitting the M' the circumstance has been little noticed.

"After a long life of laborious and painstaking industry Mr. M'Mahon paid his last debt, and left the concern to the management of his wife, who conducted it under difficulties that would have appalled most women. She, however, continued to be successful, but was at length stricken with blindness; in this condition, she still occupied a seat behind the counter, and gave directions to assistants, having a kind word and a piece of intelligence for all who frequented the shop. Her foreman supplied the flowers, seeds, plants, and bulbs for a considerable length of time, but at last she too disappeared, the store was closed, and the business passed into other and more enterprising hands.

"The writer of this very imperfect memoir, which he regrets there are not materials extant to make more complete, has been favored with the following letter from the able and well-known botanist, Dr. William Darlington, which will fitly close this record of a useful man.

"'West Chester, June 15, 1857.

"'My Dear Sir,

"'I am much gratified to learn that a new edition of M'MAHON'S "*American Gardener's Calendar*" is in press. That work was among the earliest of its kind in our country, and I have always regarded it as among the best. It is at once comprehensive and complete; and, moreover, remarkable for its judicious, practical, common-sense views of the subject.

"'I had the pleasure of knowing BERNARD M'MAHON, in my youthful days. He was, I believe, one of those *Exiles of Erin* who sought and found a refuge in our country, near the close of the last century. In the autumn, I think, of 1799, he passed some weeks in my native village of Dilworthtown, in Chester County, in order to avoid the ravages of yellow fever, in Philadelphia, where he resided; and in that rural retreat I first knew him. I renewed

the acquaintance in 1802, 3 and 4, while attending the medical lectures in the University of Pennsylvania, by which time he had established his nurseries of useful and ornamental plants: and I ever found him an obliging, intelligent, and instructive friend. He was a regularly educated gardener, of much experience and great enterprise. He gave the first decisive impulse to *scientific horticulture* in our State; and to him we are mainly indebted, among other favors, for the successful culture and dissemination of the interesting novelties collected by LEWIS and CLARKE, in their journey to the Pacific. When, in 1818, Mr. NUTTALL published his *Genera of North American Plants*, he named a beautiful shrub "in memory of the late Mr. BERNARD M'MAHON, whose ardent attachment to Botany, and successful introduction of useful and ornamental Horticulture into the United States, lay claim to public esteem:" and although the genus has been reduced by later botanists to a section of *Berberis*, it is generally known by—and I trust will long retain—the popular name of MAHONIA.

"'It was a well-deserved tribute of respect, from one who intimately knew, and could justly appreciate the merits it commemorated: and I am happy in the opportunity, even at this late day, to add my own humble and inadequate testimonial to that of so accomplished a judge of botanical worth, as THOMAS NUTTALL.

"'Very truly yours,

"'WM. DARLINGTON.'"

The M'Mahon seed list, containing the names of over one thousand plants available to American flower lovers at the beginning of the nineteenth century, is a welcome addition to the Garden's collection of these interesting and often valuable pamphlets (BULLETIN, Vol. XX, March, 1932, p. 54).

FROST DAMAGE TO CLIMBING ROSES DURING MARCH, 1932

In this locality climbing roses receive their severest test as to hardiness in early spring. After a second mild winter the roses at the Garden held every promise of blooming profusely in June, but the sudden drop in temperature in early March practically ruined those varieties which had sprouted freely during the mild weather of February. If climbing roses could remain dormant during the first warm spells in the late winter, they would not suffer from frost. In some years they are frozen during severely cold winters, but in such instances the damage results from the cold spell fol-

SHOWING ADVANCED STATE OF GROWTH OF SOME CLIMBERS BEFORE THE MARCH FREEZE

CANES OF "DR. W. VAN FLEET" STILL DORMANT DURING THE COLD WEATHER OF MARCH

MULBERRY TREE AT GARDEN AFTER FREEZE OF MARCH.
PHOTOGRAPH TAKEN MAY 11, 1932

lowing a period of mild weather which had stimulated them into active growth.

Ordinarily those climbers which are known to be tender, due to their parentage, are expected to suffer from frost damage when weather conditions are unfavorable. The variety "Silver Moon" is a good example. We know that "Silver Moon" is considered somewhat tender, and unless winter conditions are ideal it will not bloom, or at least not very freely. This year, however, "Silver Moon" and a number of other varieties, "Star of Persia," for instance, had not been stimulated into growth as early as "Dorothy Perkins" and others of the small-flowered type, with the result that the roses which remained dormant in February suffered much less during the March freeze than those which had already sent out leaves. Plate 23, fig. 1, shows how far the growth of some varieties of climbers was advanced when killed by the frost, and fig. 2 shows the canes of "Dr. W. Van Fleet," which were still dormant during the cold weather of March. The climbing roses that were covered with straw did not suffer so much as the unprotected ones. Any variety that showed green leaves, whether or not the plant was protected with a mulch, was damaged. Covering tender climbing roses has its good points in some winters, but it frequently stimulates growth to such an extent in early spring that it is impossible to retain the covering until the weather settles. It is difficult to choose the right course. The winter mulch must be removed before the tender shoots have grown too long, otherwise they will be burned when exposed to the strong rays of the sun. On the other hand, there is always the possibility of a late frost, when it would be better if the roses were covered. This unsuccessful method of protecting tender climbing roses against the changeable temperatures during February, March, and April may in time lead to some altogether different method of protection, or better still, the breeding of varieties that will remain dormant during the first mild spells of February and March.

The following climbing roses have been grouped into three classes: those that were frozen to the ground; those that were partly frozen; and those only slightly damaged. If

"Rugosa" roses were partly frozen this spring, then the cold spell must have been a severe test for any rose.

Severely Frozen	Partly Frozen	Slightly Frozen
Aviateur Bleriot	Albertine	Christine Wright
Alberic Barbier	Andre Louis	Dr. W. Van Fleet
Bess Lovett	Birdie Blye	Leontine Gervais
Bonnie Prince	Blush Rambler	Lucile
Coronation	Breeze Hill	Max Graf
Crimson Rambler	Cl. American Beauty	Paul's Scarlet Climber
Dorothy Perkins	Dr. Huey	Purity
Eugene Jacquet	Excelsa	Silver Moon
Francois Levet	Ghislaine de Feligonde	Wichmoss
Gardenia	Gruss an Freundorf	
Hiawatha	Jacotte	
Lady Gay	Mary Wallace	
Paul Noel	Milky Way	
Roserie	Neige d'Avril	
Source d'Or	Oriole	
Tausendschon	Paradise	
Wartburg	Shalimar	
Zephirine Drouhin	Star of Persia	
	Yvonne	

P. A. K.

DROUTH AND WINTER INJURY TO TREES AND SHRUBS

Few winters, no matter how cold, have caused more "frost-cracks" than the past mild winter. Frost-cracks are longitudinal splits produced by the uneven contraction of the exterior and interior portions of a tree. They usually occur during a sudden fall in temperature, and would not be expected in a warm winter. Closely associated with winter injury, this spring, we find a great deal of drouth injury. At times it is impossible to separate the two, and, since there is but little satisfaction in a post-mortem examination, it does not matter which one is responsible for the death of a tree or shrub. The all-important point is that nearly all trees in and around St. Louis have been very near death, due either to a lack of water, or, as in the case of the mulberries, to a very mild winter followed by a freeze in March. The late freeze can be charged with the death of 22 mulberries from 15 to 30 years of age, 7 willows (one of which was 32 years

old), 2 magnolias, and 8 flowering crabs, in addition to all the California privet in the Garden. It destroyed the flowers of maple, elm, magnolia, and some flowering cherries, and injured the flowers of fragrant honeysuckle and forsythia.

Drouth injury is much more serious than the loss of flowers for one season through freezing, and it is also more likely to escape attention. Since trees and shrubs have greater storage space than herbaceous plants, one dry season may do little more harm than to curtail growth, and even the second dry summer in St. Louis did not cause much destruction. However, it is evident, this spring, that a third successive dry summer would witness the death of a great number of woody plants. This was most evidenced in the uneven opening of leaf buds, especially those of elm, walnut, sweetgum, willow, basswood, and oak. The walnut orchard, despite intensive cultivation and fertilization but no irrigation, shows a very spotty opening of leaf buds, very typical of drouth injury. Some branches are clothed with leaves, others on the same tree are entirely dormant. This condition seems to be somewhat improved by the recent rains, but not in many years have woody plants been so filled with dead branches. If there is a normal rainfall during 1932 we may look for the customary growth and perhaps our irrigation problems will be over for many years.

At the Gray Summit Extension there was much less damage than might have been expected. After an unusually mild January and February the thermometer dropped to 8° F. on the morning of March 6th, and it was not until the 11th that a gradual rise of temperature began. Native trees and shrubs were practically uninjured, but the flower buds of most of the lilacs, peaches, flowering almonds, and pearlbush (*Exochorda racemosa*) were killed, as well as some of last year's wood of the flowering almond and the dwarf plum. *Rhododendron decorum, R. javanicum,* and *R. irroratum,* natives of Malay and China, were defoliated or killed to the ground. These plants were raised from rooted cuttings, started in March, 1929, and had made an unusually fine growth. They were mulched with oak leaves at the time of the freeze.

Three species of pine, namely *Pinus Massoniana,* a native of China, *P. caribaea,* of Central America, and *P. Pinea,* of the Mediterranean region, were all killed. These were three-year-old seedlings. *Cupressus arizonica* and *Thuya orientalis* var. "Rosedale" had the foliage badly injured. Of the several varieties of box which are being tested for hardiness, only one, *Buxus Harlandii,* showed any effect of the freeze. This was killed to the ground.

A. P. B.

L. P. J.

"CHINCHERINCHEE"

The title of this article is not Choctaw, as might be supposed, but is the South African common name for a member of the lily family, *Ornithogalum thyrsoides.* The origin of the native name is said to be the noise made by the stems when rubbed together. It must be confessed, however, that any one trying this experiment would be able to invent any number of names from the screech produced, depending on the way he did it and his ability to turn sound into words. Originally the name was "chincher uintje." A hundred years ago it was spelled "tinterintjes," and it is now occasionally spelled "chinkerinchee." South Africans have christened it "star of Bethlehem," but it is the same *O. thyrsoides* and should not be confused with the star of Bethlehem commonly cultivated in the United States, which is quite another species of Ornithogalum. The plant has also been called "viooltze."

The botanical name for the genus Ornithogalum is from the Greek, meaning "bird's milk," an allusion to the pure white color of the flower of some of the species. It was a proverbial expression for something dainty or precious, and any one seeing the plants in bloom at the Garden will admit the name was well chosen.

There are about one hundred and fifty species of Ornithogalum, more than half of which are native of South America. It is the "chincherinchee," however, that is beginning to appear in American markets and, strangely enough, it is not the bulbs or plants that are usually on sale, but the cut flowers, shipped from Africa. These flowers possess remark-

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THE CHINCHERINCHEE (*Ornithogalum thyrsoides*

able vitality. If the stems be cut when the lowest flowers are just about developed, all those above will gradually open and remain fresh for weeks, even without water. If gathered in bud and kept in water, in the dark, until each bud has opened, the flowers will remain fresh for two or three months. Quite an industry has developed in the shipping of cut flowers to England, where they are in great demand for the decoration of churches around Christmas time.

One does not have to depend upon Africa for a supply, however, as "chincherinchees" are easily grown from bulbs or seeds. Naturally, they cannot be established out of doors in this climate, and one still has to go to Africa to see whole fields of these lilies. They make a very satisfactory house plant, however, frequently blooming in nine months from the time the seed is sown. Germination takes place within a few weeks after sowing the seed, and when the grass-like foliage is about two inches long the seedlings are pricked off into flats. From the flats they are transferred to two and a half-inch pots and later to four-inch pots. After the "chinkerinchees" have flowered, the bulbs are gradually dried out and rested, in the same way that calla lilies are treated, and then in late summer they are repotted into the same size, or larger, pots if necessary, and grown in a greenhouse maintained at 50° F. With this treatment the plants will begin blooming in early April. The soil used for potting these bulbs is composed of three parts moderately heavy soil, two parts leafmold, a little sand, and a four-inch pot of bone meal to each barrowful of soil. Seedlings must be grown at least three years to secure large flower spikes. Large bulbs should be potted directly into six-inch pots, and they will then require no further shift.

Another South African species, *Ornithogalum aureum*, is occasionally to be seen. It has deep orange flowers, but they are fewer in number and the plants are smaller. A sport from *O. thyrsoides*, with double flowers, is frequently to be found in Cape gardens, but, so far as known, is not available in this country.

One reason for not desiring this plant to become widespread in the United States is that it is poisonous to stock. Even dry in hay it may cause death to cattle. Unlike many

of the poisonous plants of this country, the poisonous principle is not an alkaloid but is a resinous substance. There is no record of the "chincherinchee" causing trouble from contact with the skin; it must be eaten to produce any deleterious effects.

NOTES

On May 7, the Board of Trustees of the Garden met at the Gray Summit Extension for luncheon and inspection of the grounds.

The June, 1932, number of the "Ladies' Home Journal" contains an article by Mr. G. H. Pring, Superintendent of the Garden, on "The Lost Yellow Lily," illustrated with colored photographs.

Dr. Hermann von Schrenk, Pathologist to the Garden, gave an address before the National Association of Railway Tie Producers, at Memphis, Tennessee, May 18, on "Some Comparisons of the Different Species of Tie Timbers."

Recent visitors to the Garden include Prof. Eric Ruttin, of the Medical School of the University of Vienna; and Dr. A. R. Van Linge, of the Nederlandsche Kininefabriek, Maarssen, Netherlands, and Mr. R. W. de Grieff, of New York.

The annual flower sermon, for which Henry Shaw made provision in his will, was preached at Christ Church Cathedral, May 15, by Dr. Howard C. Robbins, of the General Theological Seminary, formerly Dean of the Cathedral of St. John the Divine, in New York.

Mr. L. P. Jensen, Manager Gray Summit Extension, spoke before the members of the Warrenton Garden Club, at Warrenton, Mo., April 12, on "Planting of the Home Grounds;" and before the Kirkwood Garden Club No. 1, May 3, at the Gray Summit Extension, on "Wild Flowers."

Among the recent visitors to the Garden herbarium and library were a group of students from Stephens College, Columbia, Mo., accompanied by the teacher in botany, Miss Minnie M. Johnson, May 7; the students and instructors in botany from the University of Missouri, under the leadership of Prof. H. W. Rickett, assistant professor of botany, on

May 21; and Dr. E. R. Spencer, professor of botany, McKendree College, Lebanon, Ill., with his class in bacteriology, May 21.

Mr. L. P. Jensen, Manager Gray Summit Extension, is the author of an article in the April, 1932, number of "Missouri" entitled, "Protect Wild Flowers of the Ozarks;" and also of one in the "Blue Diamond" (publication of the Kansas City Athletic Club), on "Ozarks Are a Wild-Flower Paradise." Both articles are illustrated with numerous photographs of wild flowers from the Garden Extension.

Mr. G. H. Pring, Superintendent of the Garden, spoke before the P. E. O., April 27, on "Orchid Exploration in the Andes;" before the students of Cleveland High School, May 4, on "Before and After Planting;" broadcast over Station KWK, May 16, on "Water-lilies for St. Louis;" spoke before the South Side Exchange Club, May 17, at the Saum Hotel, on "Plants of Interest;" and before the members of the Friday Club, May 20, on "Flowers and Insects."

STATISTICAL INFORMATION FOR APRIL, 1932

GARDEN ATTENDANCE:

Total number of visitors.....27,900

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 104
Total number of books and pamphlets donated..... 185

PLANT ACCESSIONS:

Total number of plants and seed packets donated..... 457

HERBARIUM ACCESSIONS:

By Purchase—

Weigel, Th. Oswald—Hamel's "Algues des Antilles Francaises" Fasc. I, Nos. 1-50, inclusive..... 50

By Gift—

Benke, H. C.—Plants of the southern Mississippi Valley.. 9
Kiltz, B. F.—*Vicia micrantha* Nutt. from Oklahoma.... 1
Stokes, James R.—*Tradescantia* sp. from Georgia..... 1
Trout, F. M.—Plant of horticulture..... 1
Woodson, Robert E., Jr.—Photographs of "*Apocynum androsaemifolium* Herb. Linn."..... 2

By Exchange—

Botanical Garden and Museum, Berlin-Dahlem, Germany —Photograph of *Verbena trifida* HBK..... 1

Total..... 65

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

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KATHERINE H. LEIGH,
Assistant to the Director

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Mycologist

JESSE M. GREENMAN,
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REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

Vol. XX JUNE, 1932 No. 6

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Floral Displays of Special Interest in 1932

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EXAMPLES OF BUBBLE BOUQUETS

Missouri Botanical Garden Bulletin

Vol. XX JUNE, 1932 No. 6

BUBBLE BOUQUETS

A recent revival of an art so old that it has become almost extinct and forgotten is that of making the bubble, or water, bouquet, or, in the more stilted phrase of the early nineties, "The Aquatic Bouquet." The renaissance of the patchwork quilt, the antimacassar, and many other loves of our grandmothers' day, has brought back with it nothing more quaint and lovely than this charming arrangement of flowers.

The simplicity of the instructions for making these bouquets is disarming, and yet these instructions must be followed implicitly if success is to be assured. A bubble bouquet is nothing more than an ordinary, simple bouquet of flowers, entirely submerged in water. For a dining-room or living-room table decoration this does not sound very plausible; but this is how it is done:

The flowers selected should be distinctive in individual form and outline, such as small lilies, calendula, tulips, freesias, violets, lily-of-the-valley, etc. These should be arranged in the hand, each flower standing alone in so far as possible. Wrap the stems with twine to hold them in position, cut the ends very short, and attach to them a piece of iron, lead, or a stone, of sufficient weight to hold the bouquet steady when immersed in water. In order to hide the weight, bits of moss or fern may be wrapped about it and tied. Place the bouquet upright in a deep glass dish, some-

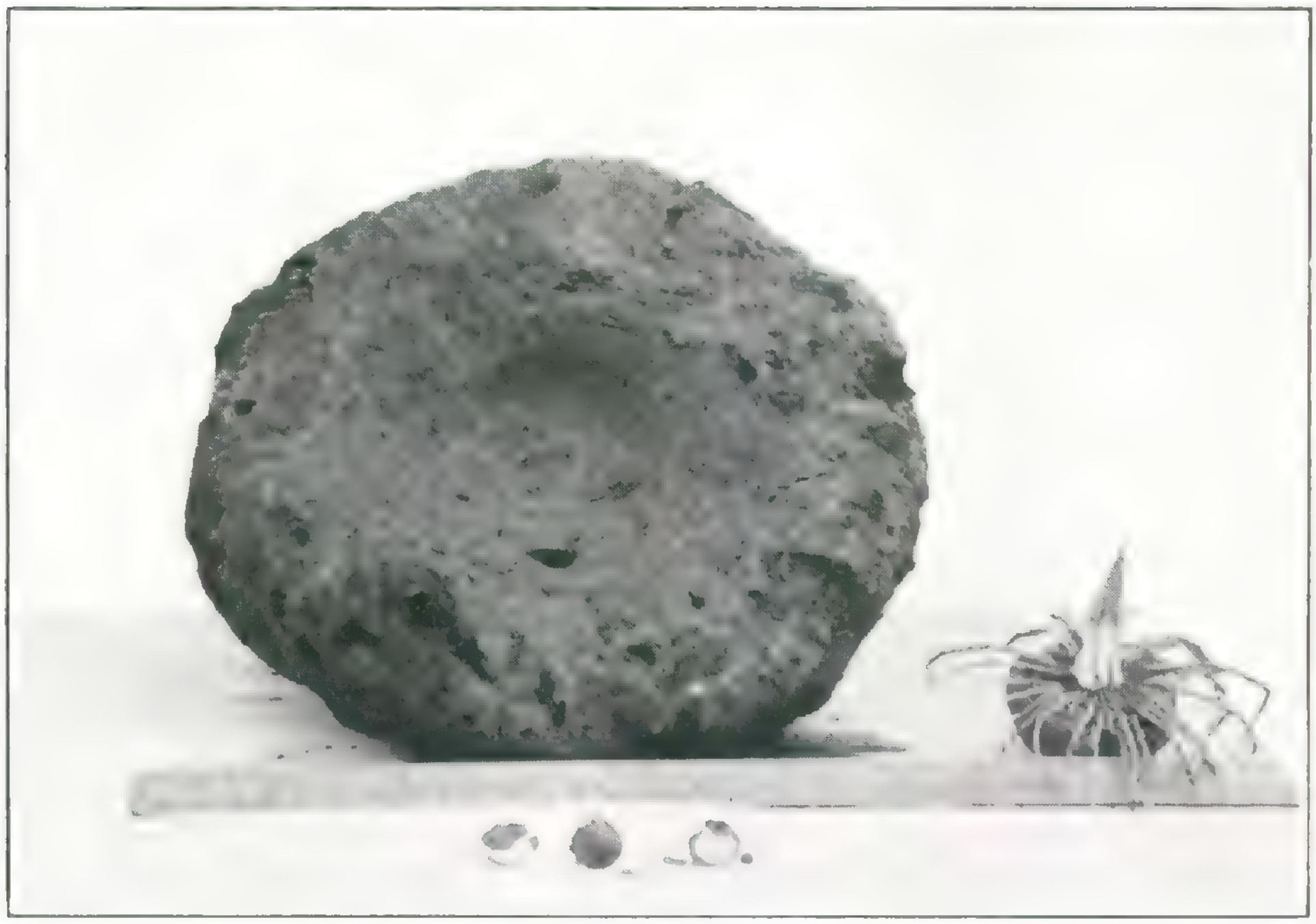
what the shape of a soup plate. Fill a deep and wide vessel with water; the bathtub is usually the most convenient. Holding the dish and bouquet firmly in both hands, sink them to the bottom of the tub of water. Then take a clear glass bowl, such as a fish aquarium, or some of the attractively shaped glassware used by pharmacists, and submerge it in the tub of water, being sure that it is entirely filled with water. Bring it upright under the water and fit its opening over the bouquet and down onto the plate or dish in which the bouquet is resting. The water in the tub must be deep enough so that this entire manipulation can take place under water. Then bring the plate, with the bowl fitted over it, to the surface, allowing any surplus water to remain around the edges. Attractive colored stones, "parrot's feather," and other small water plants may be placed around the rim of the plate, for decorative effect.

Within a short while tiny bubbles should begin to form on all the edges of the flowers, and after ten or twelve hours the entire outline of every flower and leaf should be edged with little silver droplets, looking exactly like strings of pearls. If possible, place the bouquet where it can remain undisturbed.

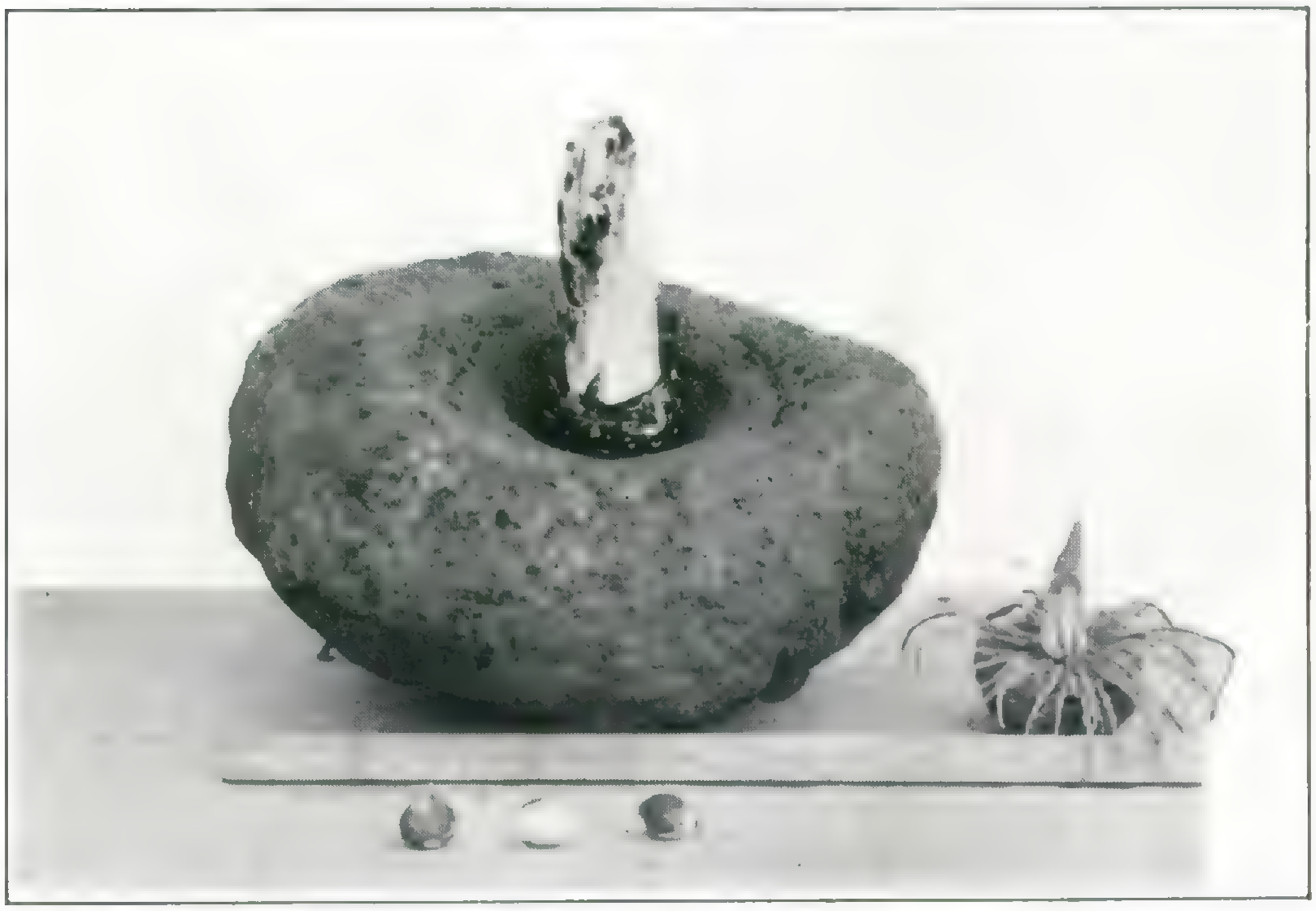
Certain details to keep in mind are: Do not have your bouquet too large or too complicated. A few simple flowers arranged at different heights will give a much better effect; in a small globe or jar, one single flower with a spray of fern is most effective. Choose flowers of distinct outline and decided color; scarlet, purple, deep pink, deep blue, and yellow are the best. Have the bouquet very low in the water; in other words, cut the stems short. The color and markings of the flowers will be greatly intensified by the water and their size many times magnified by the rounded surface of the covering bowl. Maidenhair fern is exquisite for the green of the bouquet, though asparagus fern is inclined to "bead" much more readily. Do not have the bouquet so broad that the flowers touch the glass at any point. And remember that approximately twelve hours should be allowed for the bubbles to form.

It is impossible to describe the fairy-like effect of the dazzling dewdrops as magnified by the water and refracted by

AMORPHOPHALLUS TITANUM AS IT BLOOMED AT THE ROYAL BOTANIC GARDENS, KEW, ENGLAND, IN 1889



Corm weighing 120 pounds



Corm weighing 92 pounds

AMORPHOPHALLUS TITANUM; 20-YEAR-OLD AMORPHOPHALLUS GIGANTEUM AT RIGHT; TULIP BULBS IN FOREGROUND

the light through the curved glass. Nothing can equal it as a dining-table arrangement, and if undisturbed it will last for many days.

Experiments have been made with sinking these bouquets in water in a crystal jar with a ground-glass stopper, or with simply a plate placed over the top, as in pl. 26, fig. 2, but without entire success. All that can be said for this method is that sometimes it works and sometimes it doesn't.

All the bouquets shown in the accompanying plate were exhibited at the annual orchid show of the Garden during the winter of 1931-32 and are made chiefly of orchids. But it is by no means necessary to use this aristocratic and expensive flower; in fact, many other flowers less difficult to obtain lend themselves much more satisfactorily to the making of a bubble bouquet. K. H. L.

A TITANIC PLANT

The giant redwoods of the Far West, together with the eucalyptus tree, are usually regarded as the tallest and most massive of any land-grown vegetation. The *Victoria regia,* with its leaves five and six feet in diameter, holds the record in this particular field for water-grown plants, although some of the brown seaweeds exceed in length, by two or three times, the height of the tallest tree. *Welwitschia mirabilis,* from the deserts of southwest Africa, is another giant of the vegetable world. It resembles a huge radish, with a circumference of from twelve to fifteen feet, and has two oblong, leathery leaves from six to eight feet in length.

Coming to the floral world, the Rafflesia, a parasitic plant from Sumatra, with flowers three feet across, has long been recognized as producing the largest single flower known in nature. Strangely enough, in 1878, Dr. O. Beccari, an Italian botanist, found growing in Sumatra, side by side with Rafflesia, a plant which produces a flower spike even larger, so that he christened it "Titanum." Eventually it was recognized as being a species of the genus Amorphophallus, and to-day it is known as *Amorphophallus Titanum.* Strictly speaking, Rafflesia has never been exceeded in the

size of its flowers by any other plant, but *A. Titanum,* with its immense cylindrical spike of flowers (the spadix), surrounded by a huge sheathing bract (the spathe), something like the jack-in-the-pulpit or arum, is so much larger than any known inflorescence that it has come to be regarded as one of the wonders of the plant kingdom.

The corm dug up by Dr. Beccari was nearly five feet in circumference and was so heavy that two men could scarcely carry it. From this corm only one leaf was produced. The leaf stalk was ten feet high, dividing at the top into three branches, each as thick as a man's thigh. The blade, repeatedly subdividing, produced a leaf twelve feet long and covering an area of forty-five feet in circumference. Dr. Beccari sent seeds and corms of this marvelous plant to Florence, but owing to the laws intended to prevent the introduction of the Phylloxera insects, the corms were not allowed to enter the country, and perished. The seeds, however, germinated, and the next year (1879) a seedling was sent to Kew Gardens. All the seedlings at Florence perished but after ten years the plant flowered at Kew, in June, 1889. By this time the corm was eighteen inches wide, twelve inches thick, and weighed fifty-seven pounds. When the flower bud appeared it developed rapidly at the rate of about three inches a day until it attained a height of nearly seven feet. The central spike, or spadix, was five feet long, a foot wide, club-shaped, of a pale greenish yellow color. It stood erect in the middle of the bell-shaped spathe, which was three feet eight inches across the mouth.

"It is impossible to convey in words any accurate idea of the stateliness and massive grandeur of this huge inflorescence," wrote a member of the Kew staff who viewed it for the first time. As soon as the spathe expanded, the house in which the plant stood was filled with an odor resembling putrid fish. Flies of all kinds were attracted by the smell and buzzed about the flower in great numbers. According to one account, the smell lasted but a few hours and was never even noticed by the public, but there can be little doubt that under ordinary circumstances the putrid odor given off by the plant, which is very attractive to insects, thus favoring pollination, is anything but agreeable. But as an

SECTION OF FLOWER BUD OF AMORPHOPHALLUS TITANUM

1

BEGINNING OF A SHARP FORK IN A MOLINE ELM; SMALL LIMBS SHOULD BE REMOVED AT THIS TIME

2

POCKET BEGINNING TO FORM IN A PHELLODENDRON TRUNK; BARK SEAM WILL FOLLOW

English writer at the time said, "Imagine a flower almost of the dimensions of Big Ben at Westminster being objected to simply because it happens to have a disagreeable odor."

On June 28, 1901, *Amorphophallus Titanum* flowered for the second time at Kew Gardens, and so far as is known, these are the only two occasions when the plant has bloomed outside its native Sumatran home. The second flower was not as large as the first, being only forty-nine and one-half inches high on the day of opening. It began to open in the afternoon and by 6 p. m. had fully expanded. By the next morning the immense spathe had commenced to collapse, and under ordinary circumstances the flower remains fully expanded for less than twenty-four hours. The odor ceases when the flower closes.

In accordance with the policy of the Garden, to obtain whenever possible plant curiosities of the world, efforts to obtain corms of this titanic Amorphophallus have been made from time to time. It was even thought at one time that it might be worth while sending an expedition to Sumatra, primarily for the purpose of obtaining this plant, together with certain other rare species which grow only in the East Indies. Fortunately, however, last January, we obtained information from a nurseryman in Sumatra that he was in a position to supply corms of this plant. An order was immediately placed for two of them. These arrived on June 27, after a trip half way round the world, the corms weighing respectively 120 and 92 pounds and measuring 6 feet 5 inches and 5 feet 6 inches in circumference (see pl. 28). They were immediately given special care, and it is needless to say that everyone connected with the Garden, as well as the citizens of St. Louis, will look forward with eager anticipation to the appearance of the titanic flower cluster, which may well be regarded as one of the rarest curiosities of the vegetable kingdom.

WEAK BRANCHING IN TREES

On several occasions the BULLETIN has pointed out the disadvantages of sharp "V" forks in trees. It has suggested a method of bracing with cables to prevent splitting, and it has shown that early removal of the smaller limb is the best way to avoid future trouble from wind and sleet.

So far no detailed description of the interior of a forked tree has been published. It is the purpose of this article and the accompanying photographs to show how such forks endanger the future welfare of a tree. These forks begin when two limbs grow upright and nearly parallel at about the same speed. Later, when they increase in size, the two inside surfaces meet (pl. 30), forming a collar of bark. The two limbs are then pushed farther apart with each season's growth. At some future time the pressure of the expanding tissue is great enough to kill the bark in the center. This becomes more and more aggravated with each season's growth, until finally a pocket is formed in the center. Since the bark is dead, that portion of the tree is unprotected, furnishing ideal lodging for the spores of decay fungi. Summer rains keep this pocket filled with water, which freezes during the winter. The freezing further helps to push the two limbs from a vertical position, causing the fork to split. Wind often twists the two limbs in opposite directions, and the grinding motion which then occurs kills more of the bark at the edges of the split. After many years, if storms have not demolished the tree, the fork will appear as in pl. 31, fig. 1. Should the tree be then cut down and examined it will be found to have the structure of two individual trees (pl. 31, fig. 2), with the split continuing much farther downward in the interior than is shown by the outside bark. Only the growth of a single summer (pl. 32, fig. 1) will be continuous around the tree, and this will be broken the following winter. Above this the union of the two trunks becomes even less solid (pl. 32, fig. 2), until they finally separate.

This type of branching always furnishes an ideal point of attack for the many enemies of trees, since the armor of bark is absent. Furthermore, the leaning trunks are more readily injured by sleet and wind. A. P. B.

1

SHARP FORK IN A MATURE HORSE-CHESTNUT. NOTICE LEAVES HELD IN POCKET AND WATER SEEPING FROM IT (DARKENED PORTION ON TRUNK)

2

TRANSVERSE SECTION TWO FEET BELOW TOP OF FORK, SHOWING DEAD BARK SEAM IN INTERIOR

1

UPPERMOST SECTION OF AILANTHUS TREE. WHITE RING AT OUTSIDE SHOWS POINT OF ATTACHMENT, THIS BEING TOP OF POCKET

2

GROUND-LEVEL SECTION OF AILANTHUS TREE. DARKENED AREA IS DEAD AND CRUSHED BARK

WRITTEN ZINC LABELS AGAIN

In view of the numerous references to the various formulas used for zinc labels that have recently appeared in a number of horticultural journals, including the note in the February BULLETIN, the following extract from the "Horticultural Register," Vol. 1, 1835, p. 34, is of interest historically:

"ON A NEW METHOD OF WRITING ON ZINC, FOR LABELING PLANTS"

"Mr. Henry Braconnot, the celebrated French chemist of Nancy, to whom we are indebted for the curious transformation of rags and other similar vegetable substances into starch, gum, and sugar, by the agency of Oil of Vitriol, and whose name is well known in the chemical world for various researches connected with the analysis of vegetable substances, has given in the last number of the Annales de Chimie et de Physique, a preparation for writing on plates of zinc to label plants. The writer, having a dislike to painting in oil, which is often inconvenient, and never endures a long time, resolved to turn his attention to some other way which would prove both ready and durable. The system of writing on zinc with a black crayon, which was accidentally discovered by M. Symon, an Amateur of Brussels, and noticed in the *Revue Horticole* for October, 1832, and the *Bon Jardiniere* for 1833, possessing many imperfections, led Mr. Braconnot to try some experiments, being anxious to obtain a liquid, or a species of ink, which would be perfectly durable when exposed to the changeableness of the weather, and also one with which he could write with ease. This end, after several proofs, he is induced to believe he has in a great measure attained. If it answers, he will have done both the botanists and amateurs a great service. The preparation is as follows:

Take Verdigris in powder one part,
Salamoniac in powder one part,
Lamp black (Mori de Fumea) half a part,
Water ten parts;

Mix these in a glass or pot mortar, at first only adding as much water as will mix it well, then add the remainder of the water; when placed in a vessel, let it be well shaken up from time to time, and in a few days it will be ready for use. This is not only excellent for labeling plants, but also for marking objects it is wished to preserve in low, wet situations, and for marking key, becoming quickly dry and being very durable.

A NEW ALGA FOR MISSOURI

On May 29, as a group of students from the Missouri Botanical Garden were rambling along the banks of the Little St. Francis River somewhere between Fredericktown and Roselle, Madison County, Missouri, a somewhat profuse and unfamiliar vegetation covering a number of the submerged rocks in the stream attracted the writer's attention. The water of the stream was shallow with a rather slow-running but steady current. The characteristic habit of the plants suggested an alga which none of the group could name, so a small collection was brought into the laboratory for further examination. Sections of the shoot immediately revealed that it was a member of the Rhodophyceae (Red Algae). Drouet's list of the Algae of Missouri, in the May issue of the "Bulletin of the Torrey Botanical Club," appeared to be the logical place to find it recorded; but, alas, further search for its identity was necessary. There seems to be no doubt that the plant is a species of the genus Lemanea hitherto unreported from Missouri. The specimens collected are the obvious sexual shoots containing carpospores. A more detailed study of the material will be necessary to determine the species with any degree of accuracy. This note is merely to record the occurrence of the genus in Missouri.

LILY M. PERRY

NOTES

The delegates to the convention of the Zonta International, which met in St. Louis, June 15–18, visited the Garden the afternoon of June 18.

The article "Snake Bites and Dutchman's Pipe," from the April number of the Garden BULLETIN, has been reprinted in the June number of the "National Druggist" (Vol. 62, No. 6).

Mr. L. P. Jensen, Manager Gray Summit Extension, spoke before the Federation of Evangelical Brotherhoods of St. Louis and vicinity, at St. Matthew's Church, June 13, on "The History of Landscape Art."

The Washington (Mo.) "Missourian" (June 17, 1932) has reprinted extracts from the address by Mr. L. P. Jensen, Manager Gray Summit Extension, delivered at Detroit several months ago, on "Missouri Botanical Garden; Scene of Varied Experiments."

On June 15 Mr. G. H. Pring, Superintendent of the Garden, addressed a meeting of the Missouri and Illinois Cemetery Officials, in convention at the Hotel Jefferson, on "Experiments with Grasses Suitable for Lawns," and on June 16 the members were conducted through the Garden.

Mr. G. H. Pring, Superintendent of the Garden, acted as judge for the flower show at Eureka, Missouri, June 4; and he has been appointed chairman of installation of exhibits for the Fourteenth National Flower and Garden Show to be held at the Arena in St. Louis, March 25–April 2, 1933.

At the commencement of Washington University, June 9, degrees were conferred on students in the Henry Shaw School of Botany, as follows: Doctor of Philosophy—Caroline K. Allen, Harry J. Fuller, and Lily M. Perry; Master of Science —Mary Ledgerwood Fuller, Dorothy Megowen Berkley, and Mary Elizabeth Pinkerton.

Recent visitors to the Garden library include Miss Catharine M. Lieneman, instructor in botany, North Carolina College for Women, Greensboro, N. C.; Prof. W. O. Richtmann, associate professor of pharmacy, University of Wisconsin; and Prof. and Mrs. Bertrand F. Harrison, of Brigham Young University, Provo, Utah.

Dr. George T. Moore, Director of the Garden, has given the following talks recently: May 31, before the Exchange Club at the Hotel Claridge, on "Henry Shaw and His Contribution to St. Louis' Progress"; June 1, before the educational group of the Y. M. H. A. and Y. W. H. A., on "Intelligence in Plants"; June 3, before the St. Louis Horticultural Society, on "What Goes On Inside the Plant"; June 8, before the annual meeting of Moorlands Addition Improvement Association, in Clayton, on "The Effect of Smoke on Plant Life."

The following extract from a letter recently received from Mr. Gurney Wilson, Representative of the Garden in Europe,

is of interest in connection with the recent articles which have appeared in the BULLETIN relative to the Garden's collection of seed catalogues:

"On hearing that Sanders were closing down their St. Albans nursery, I took the opportunity of paying an early visit, and although they had none of their own catalogues, I procured a number of Veitch's catalogues at quite a reasonable sum. All of Veitch's catalogues are much sought after, especially those dealing with Chinese plants.

"I have selected a number of them which do not appear to be duplicates of those sent to you on previous occasions, and have despatched them in two packages per book post.

"This should make your collection of Veitch's catalogues one of the most comprehensive in existence."

STATISTICAL INFORMATION FOR MAY, 1932

GARDEN ATTENDANCE:

Total number of visitors.....45,442

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 44
Total number of books and pamphlets donated..... 596

PLANT ACCESSIONS:

Total number of plants and seed packets donated..... 146

HERBARIUM ACCESSIONS:

By Purchase—

Lundell, C. L.—Plants of Yucatan..... 20
Moore, J. A., and J. A. Steyermark—Lichens, hepatics, and mosses, chiefly from Texas..... 323
Schipp, W. A.—Plants of British Honduras..... 107
Stevens, Prof. F. L.—Fungi of the Philippine Islands and the American tropics..... 180
Sydow, H.—"Mycotheca germanica," Fasc. L-LII, Nos. 2451-2600, inclusive 150
University of Minnesota—Holway's "Reliquiae Holwayanae," Fasc. VII-XIV, Nos. 301-700, inclusive..... 400
University of Minnesota—South American fungi..... 215
Weigel, Theo. Oswald — Spegazzini, C., "Hongos Sud-Americanos. Decades mycologicae Argentinae," Fasc. I-V, Nos. 1-50, inclusive..... 50
Weigel, Theo. Oswald—Junge, C.—Plants of the Island of Chiloe, Chile 25

By Gift—

Buchholz, Prof. J. T.—*Juniperus* from Arkansas..... 9
Dodge, Prof. C. W.—Plants of Costa Rica..... 38
Featherly, Prof. H. I.—*Camelina sativa* (L.) Crantz subsp. *pilosa* (DC.) Zinger from Oklahoma..... 1
Foreau, G.—Parasitic fungi of British India..... 15
Goodman, George J.—Fungi of Utah..... 2
Harrison, Bertrand—Plants of Utah, etc..... 232
Herter, W.—Lichens of Uruguay..... 3
Hume, H. Harold—Plant of Louisiana..... 1
Kiltz, Prof. B. F.—Plant of Oklahoma..... 1
Lahman, Mrs. C. E.—Plants of Oklahoma and New Mexico 11
Luyties Pharmacal Co.—*Gnaphalium purpureum* L. from Alabama 1
Stratton, Prof. Robert—Plant of Oklahoma..... 1

By Exchange—

Gray Herbarium of Harvard University — Plants of Brazil collected by H. N. Whitford	22
MacFadden, Mrs. Fay A. — Hepatics and mosses from British Columbia and Alberta, Canada	636
Philadelphia Academy of Natural Sciences—Plants of New Jersey	66
U. S. Department of Agriculture, Bureau of Plant Industry, by John A. Stevenson—Fungi, mostly from New York	79
University of California—Plants of California	200
Total	2,788

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
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KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
Pathologist

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TROPICAL STATION, BALBOA, CANAL ZONE

A. A. HUNTER,
Manager

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

Vol. XX SEPTEMBER, 1932 No. 7

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Floral Displays of Special Interest in 1932

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1

Normal (left) and waxed flower (right) photographed at noon the first day of the experiment

2

Normal (left) and waxed flower (right) photographed at midnight the first day of the experiment

3

Normal (left) and waxed flower (right) photographed at noon the second day of the experiment

4

Normal (left) and waxed flower (right) photographed at noon the third day of the experiment

Missouri Botanical Garden Bulletin

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KEEPING THE WATER-LILY AWAKE

Among the Nymphaeas, or water-lilies, there are many species and hybrid varieties that are day-blooming in habit, while others open only in the evening and close before noon of the following day. Nature has provided these two groups of water-lilies in order that we may enjoy their interesting flowers at all hours. However, it is unfortunate that the night-blooming lilies do not have the range of color and refinement that is found in the day-blooming group, and cross-pollination of these two types at the Garden has so far been unsuccessful.

Since the flowers of the day-blooming water-lilies normally close up tight late in the afternoon, they are useless for table decorations in the evening. This habit of "going to sleep" has also been a serious handicap in the satisfactory exhibition of Nymphaeas at flower shows, for the closed buds are never so attractive as the open flowers. Obviously, a method of keeping the flowers of the day-blooming water-lilies open at night for exhibition would be of value.

Recent experiments at the Garden have definitely shown that it is possible to keep the flowers of the day-blooming water-lilies open continuously for several days by treatment with paraffin. With the aid of a medicine dropper melted paraffin is carefully applied in small quantities to the extreme lower portions of the stamens, the petals, and the

sepals. It is highly important to use a paraffin with a low melting point, 47° C. or less, in order to prevent injury to the floral tissue. Rapid cooling of the paraffin after contact with the flower is also essential. The melted paraffin is uniformly dispersed among the bases of the stamens, petals, and sepals, forming a cast which holds the floral parts rigidly in place, thus preventing the normal closing of the flower. When the operation is carefully done the paraffin is hardly visible even at close range, and the flower appears perfectly natural. If necessary, the paraffin may be tinted with dyes to match the colors of the flowers.

The water-lily used in this experiment was *Nymphaea* "Mrs. G. H. Pring," a new hybrid white tropical day-blooming variety developed at the Garden. The best results were obtained by cutting the flowers in the forenoon of the first day the buds opened in the pool. As soon as the flowers are cut they should be placed in a deep container of fresh water and stored in a cool, light room until the morning of the following day, when the flowers will be wide open and at their best. This is the opportune time to apply the paraffin. It is advisable to treat the stamens first and gradually work out to the sepals, success depending in large measure on the quickness and dexterity of the operator.

In the series of photographs presented (pl. 33) two first-day flowers of the variety "Mrs. G. H. Pring" were used, one flower being treated with paraffin while the other was permitted to react normally to serve as a check. In fig. 1 it will be noted that the treated flower on the right bears no evidence of having received the paraffin treatment. This photograph was taken on the morning of the second day shortly after the paraffin was applied. Figure 2 shows these two flowers late in the evening of the same day. The check flower is completely closed, but the treated flower remains wide open with no trace of injury. The experiment was continued to observe the reactions of the flowers on the second and third day after treatment. In fig. 3 it is evident that the treated flower is in far better condition than the check on the second day. The stamens of the check flower are showing signs of deterioration, while those of the treated flower remain in uniformly fine condition. On the third day, fig. 4,

MATURE TREE OF GLEDITSIA TRIACANTHOS VAR. INERMIS

BRANCH OF GLEDITSIA TRIACANTHOS VAR. INERMIS

the check flower fails to open after closing the preceding evening, but the treated flower, although slightly browned at the tips of a few petals, is still open and in good condition.

The paraffin treatment, then, not only makes possible the use of the flowers of the day-blooming water-lilies for exhibition in the evening, but also keeps the flowers in better condition and retards the disintegration of the floral parts. The method has not been successful with the night-blooming water-lilies. The flowers of this group lack the substance necessary to support the large petals, and the paraffin treatment appears to hasten the death of the inflorescence.

D. C. Fairburn

THE THORNLESS HONEY LOCUST

Among our native trees the honey locust, or three-thorned acacia (*Gleditsia triacanthos* L.), deserves general recognition because of its hardiness and beauty. It is a large tree, 70 to 140 feet high, with a trunk diameter of 3 to 5½ feet. The bark is rough and deeply furrowed, the twigs brown and smooth. The branches, and often the trunk, are studded with clusters of curious, triple-pointed thorns four or five inches in length. The buds are clustered and nearly hidden in winter. The leaves are 7 to 8 inches long, alternate, once or twice compound, pinkish when opening, changing to dark green, turning yellow in autumn, leaflets 18 to 25, ovate. The flowers appear in inconspicuous small greenish racemes in May or June, the staminate and pistillate ones on the same or different trees. The fruit is a flat, pendent, twisted pod 8 to 16 inches long, bright green, turning brown when ripe, containing 10 to 15 hard, flat, brown seeds. The pulp has a sweet taste, somewhat resembling honey, hence the name honey locust. The wood is hard, strong, coarse-grained, of a reddish-brown color, with thin, pale sapwood. It is very durable and is used for fence posts and rails, the hubs of wheels, to some extent in construction, and for fuel.

The tree is found in rich woods and along streams, but adapts itself easily to other conditions. Its natural distribu-

tion is from New York and Pennsylvania south to Mississippi, west to Nebraska, Kansas and Texas.

The honey locust is valuable for timber belts, windbreaks, and hedges, and when planted close together and trimmed it makes a hedge which cannot be penetrated by man or beast. The wide-spreading, horizontal branches form a fine, broad head, and the light, feathery foliage, in the sunshine, presents an airy and transparent appearance which contrasts pleasingly with other trees. The light green fruit in summer gives the whole tree a beautiful and distinctive character.

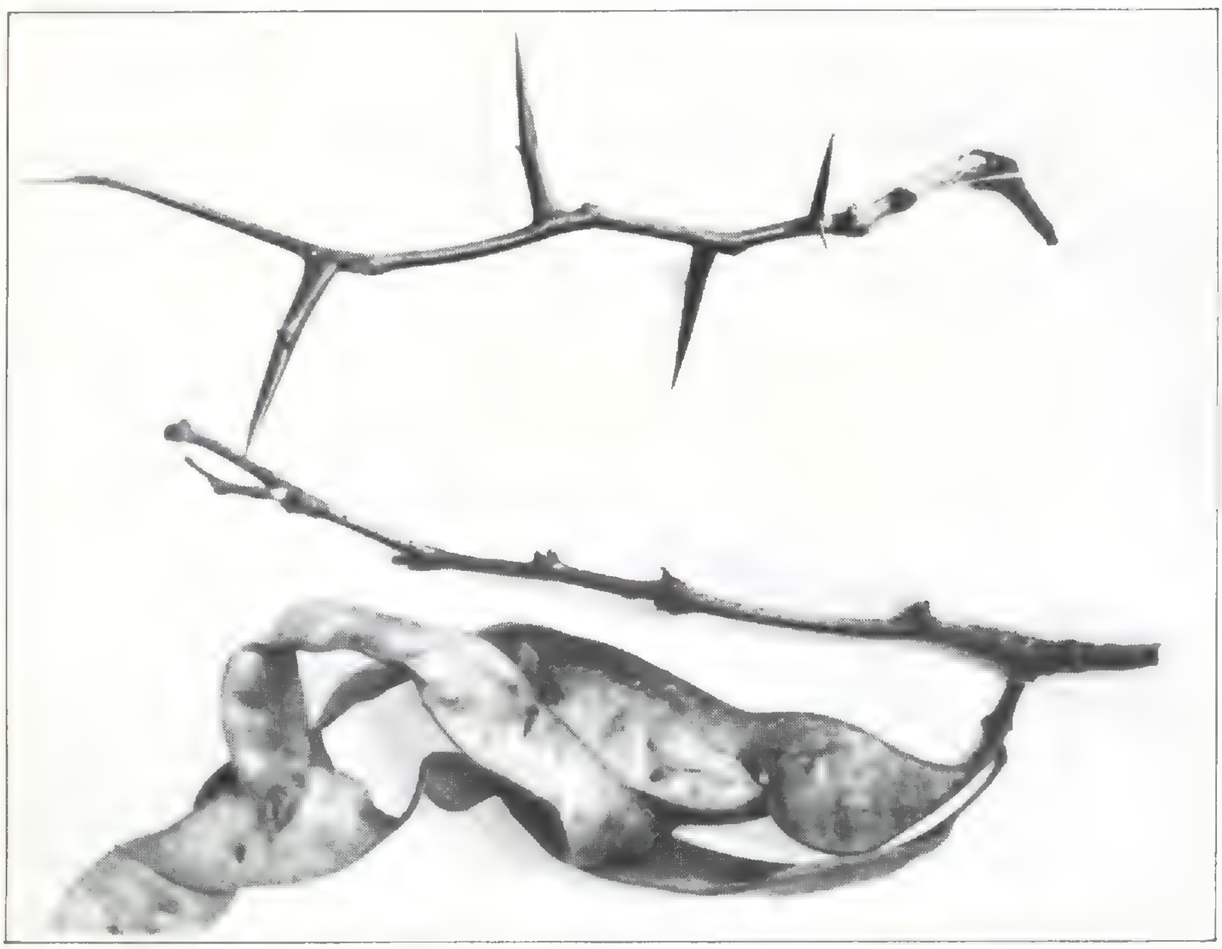
The honey locust is a sturdy, long-lived tree, comparatively free from attacks of insects and diseases. It would be an excellent tree for ornamental planting, except for one objection—its vicious and dangerous thorns. Fortunately, there is a thornless variety, *Gleditsia triacanthos* var. *inermis* Pursh, which is fairly common in our local territory. Experiments carried out at the Garden Extension at Gray Summit during the past four years show that plants of this thornless variety may be raised from seeds very easily. Seeds collected from the trees of this variety will produce about sixty per cent of thornless plants, whereas seeds from the thorny trees will give only about two per cent of the thornless variety. Seeds planted in autumn, as soon as ripe, will produce trees of sufficient size for permanent planting in about three years. Moreover, as the thorns are produced in the second year, it is possible to eliminate the thorny plants at the time of lining the plants in the nursery rows, with but little loss of space and labor.

L. P. J.

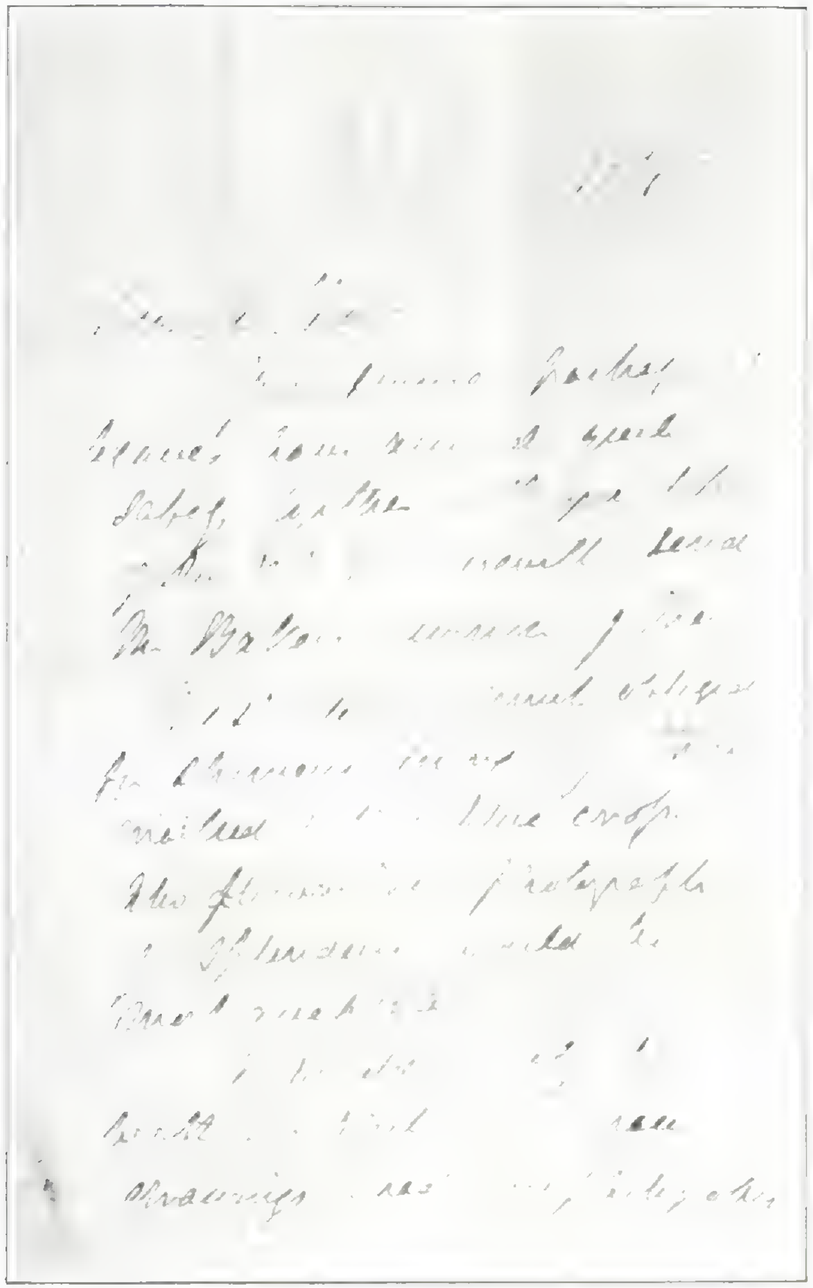
KEW GARDENS AND THE MISSOURI BOTANICAL GARDEN

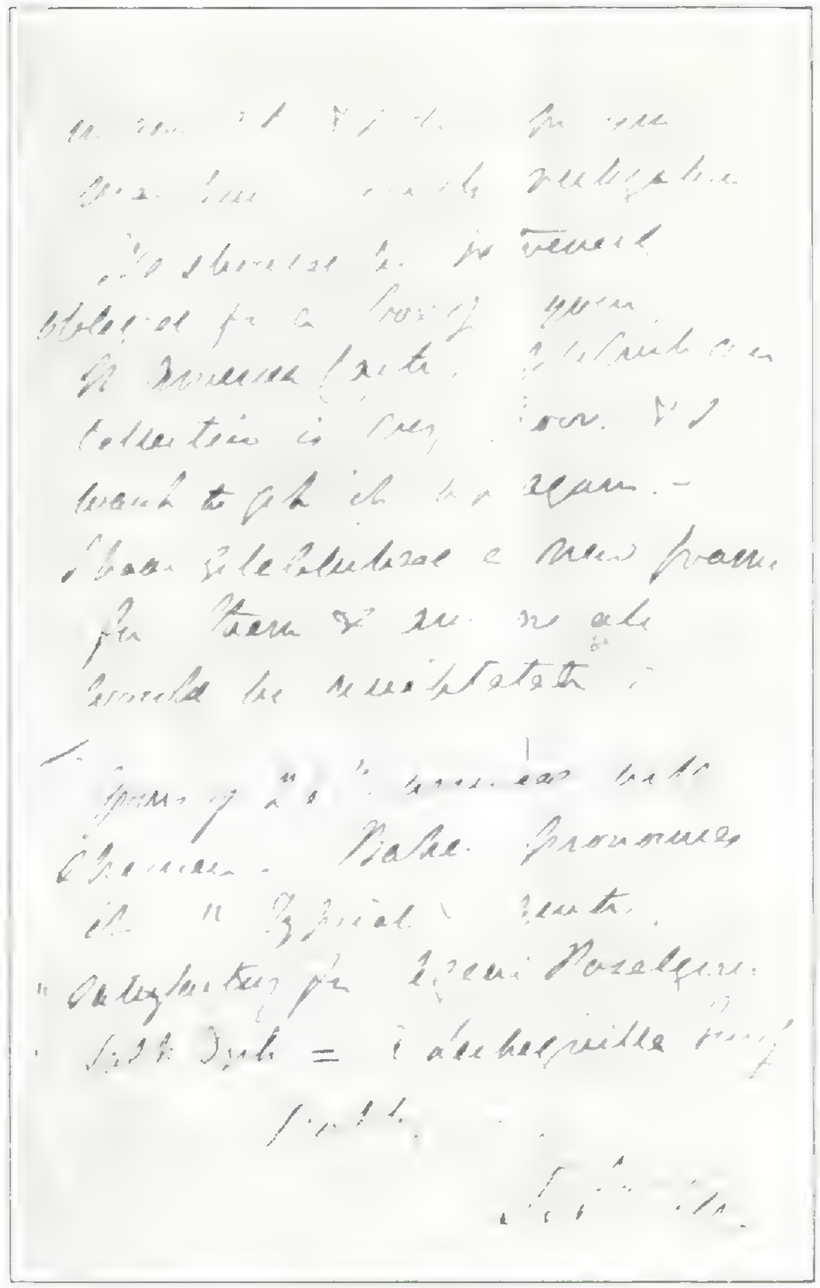
A letter from Sir Joseph Hooker, Director of the Royal Botanic Gardens at Kew in 1885, to Henry Shaw (pl. 36), has recently come to light among some old papers. It seems worth while to reproduce it as evidence of the cooperation existing between these two famous gardens nearly fifty years ago. It also furnishes evidence of Mr. Shaw's interest in the

BRANCH OF GLEDITSIA TRIACANTHOS



TWIGS OF GLEDITSIA TRIACANTHOS (LEFT) AND VAR. INERMIS (RIGHT)





REPRODUCTION OF FIRST AND LAST PAGES OF SIR JOSEPH HOOKER'S LETTER TO HENRY SHAW

Agaves, which was probably first aroused by Dr. George Engelmann; a group so thoroughly investigated over a period of years by Dr. William Trelease, the first Director of the Missouri Botanical Garden.

"ROYAL GARDENS, KEW

"January 17/85

"Dear Mr. Shaw:

"Your several packages of Agaves have arrived quite safely, together with your letter of Dec. 19th, and I herewith send Mr. Baker's revision of them.

"We should be much obliged for specimens (living) of those marked with a blue cross. Also flowers and photographs of specimens would be most acceptable.

"It would surely be worth the while to have drawings made or photographs, and flowering panicles a part of them dried, of every species, and if this could be done in duplicate and one set sent numbered to us at Kew, we should then be en rapport with the U. S. in all matters concerning this splendid but difficult group of plants.

"Yes, Aloe Barberae is a splendid thing. It has not flowered with us.

"Gray told me of the admirable arrangements made for the perpetuation of botany in your city and I do hope you may live to see the realization.

"We should be eternally obliged for a box of your N. American Cacti, of which our collection is very poor, and I want to get it up again. I have established a new frame for them and any or all would be acceptable.

"Yours of 26th arrived with specimen. Baker pronounces it 'Typical and quite satisfactory for Agave Poselgerii Salm Dyck = A. Lecheguilla Torrey.'

"Most ty. yrs.,

"J. D. HOOKER."

NOTES FROM THE REPRESENTATIVE IN EUROPE

Chelsea Flower Show, London.—For a long period the Royal Horticultural Society held its annual Spring Flower Show in the Temple Gardens, London, but as the Society grew in membership and the exhibitors became more numerous the event had to be arranged on a larger scale and on a greater acreage of land. The extensive grounds of the Royal Hospital at Chelsea, just a few miles west of the for-

mer site, and also adjoining the river Thames, were selected as the most suitable place, for the position is easily accessible from all parts of London, while the fully grown trees and undulating lawns add much to the general effect. And so, from 1912 onwards, the greatest flower show in the world is arranged within a few miles of Westminster Abbey and other historic buildings. As soon as the year's show is over, letters are mailed to all the officials and principal exhibitors asking that, while the proceedings of the event are still fresh in their minds, they make suggestions for the improvement of any section or regulation in the show of the following year.

Early in the month of May workmen are busy erecting the huge tents, the largest of which covers an area of 420x200 feet, and placing in order the many other temporary buildings in accordance with plans carefully prepared in advance. In addition to several acres of tents for sheltering the floral exhibits, many other tents are required for meetings of the council, the various committees, clerical staffs, and the refreshment caterers, while a well-equipped post-office and an adequate telephone service have also to be installed.

But the most careful preparations are frequently upset by the wild freaks of English weather. During two or three days before this year's show the weather was fairly good, but a few hours before the time of opening the heaviest rainfall of the year occurred; even the gullies and drains specially prepared for such an event proved inadequate. It therefore became necessary to engage an all-night service of men to lay down many tons of hard grit on the sodden foot-paths.

As well over 100,000 people visit the show, the catering arrangements are on a large scale. While it may be comparatively easy to arrange for the hundreds of dinners given to the judges and officials and the more numerous luncheons and teas provided for the exhibitors and their assistants, no one knows with certainty what the weather may be on the following day. At the end of May summer weather may rightly be expected, but this year a deluge of rain occurred within 24 hours of the opening of the show, and the temperature during the night fell to 40 degrees Fahr. It was a time of real anxiety to the growers of tropical plants, for no artificial heat whatever was available in the tents, and

large openings at each end allowed a cold wind to blow through. The refreshment caterers also had an anxious time, for, while in some years a temperature of 80 or more degrees may need the preparation of tons of ice cream and cooling drinks, a fall to 40 degrees, as occurred this year, entirely changed the requirements of the public.

At the hour when all preparations must be completed, the great body of willing workers leaves the grounds and the judges arrive upon the scene. To be selected as one of the judges is a great horticultural honour, but the privilege of being almost alone in that fairyland of flowers is indeed a greater one. During the period of judging, the show is visited by the King and the Queen and other members of the royal family. About an hour later the various committees assemble for adjudicating the merits of single plants that have been entered for the purpose. There are separate committees for all the principal sections of horticulture, and as each committee sits regularly at the fortnightly meetings of the Society, it is well acquainted with its duties.

As each year the Society increases in membership and the show attracts more of the public, so the difficulties of arranging for the multitude of visitors become greater. The 30,000 Fellows of the Royal Horticultural Society rightly say that at their own show they should have some priority in admittance. This is partly provided for by charging an entrance fee of $2.50 to the public, a sum that is, however, readily paid by several thousands of people on the opening day. This year a new experiment was made by mailing in advance to each Fellow a personal pass that would admit him or her to a private view on the evening before the show was opened to the public. Almost every recipient of a personal pass seemed to have entirely disregarded the large number of such passes that were issued, and looked forward in keen anticipation to being one of a small party of highly favoured people who would view the show in comfort, in fact, with equal freedom to that enjoyed by the judges a few hours previously. But, as was expected by the wise folk of experience, almost the whole of the 30,000 Fellows attended the show simultaneously, and the so-called "private view" proved a great dillusion.

As the Chelsea Show is held about the end of May, the date is a little too early for the majority of American visitors to London, hence they miss one of the principal sights of the season. However, a few weeks later many of the private gardens may be inspected on certain days, and these will well repay the visitor, for the flowers are then to be seen under the more or less natural conditions provided for them by amateur and professional growers.

G. W.

NOTES

Mr. G. H. Pring, Superintendent of the Garden, spoke before the United States Department of Agriculture Club, September 9, at the American Hotel, on "The Activities of the Missouri Botanical Garden."

On August 25 a wreath of magnolia leaves and orchids was placed by the Director on Henry Shaw's tomb in commemoration of the forty-third anniversary of Mr. Shaw's death. All the employees of the Garden were assembled at the mausoleum.

A double number of the ANNALS OF THE MISSOURI BOTANICAL GARDEN (Vol. XIX, Nos. 2–3) was issued in June, containing two papers: "A New Nama from Idaho" by George J. Goodman, and "A Monographic Study of the Genus Lycium of the Western Hemisphere" by Charles Leo Hitchcock.

Mr. G. H. Pring, Superintendent of the Garden, acted as judge at the Glendale Garden Club flower show, at the Glendale High School, September 10, at the St. Louis Horticultural Society garden contest, September 12, and at the East St. Louis garden contest, September 15.

The United States Department of Agriculture Club visited the Garden Extension, Gray Summit, Mo., August 20, and the Greater St. Louis Association of Gardeners, on September 4. Mr. L. P. Jensen, Manager Gray Summit Extension, gave a talk to each organization on "The Gray Summit Extension."

Dr. George T. Moore, Director of the Garden, gave the

following talks during the summer: July 14, before the Kiwanis Club, at the Hotel Statler, "What St. Louis Owes to Henry Shaw;" July 20, before the South Side Optimists' Club, at Bevo Mill, "Advertising St. Louis with Flowers;" September 7, before the St. Louis Lions Club, at the Hotel Statler, "Henry Shaw and His Garden;" September 13, before the "X" Club, at the American Annex, "St. Louis and Its Garden."

Among the visitors to the Garden library and herbarium during the summer were: Dr. Marie Victorin, head of the department of botany of the Université de Montréal; Mr. Donald P. Rogers, graduate student in botany at the University of Iowa, Iowa City; Mr. William H. Judd, Propagator, Arnold Arboretum of Harvard University, Jamaica Plain, Mass.; Dr. Theodor Just, assistant curator, Greene Herbarium, University of Notre Dame, Notre Dame, Ind.; Miss Aileen Neuhauser, of Garfield Park, Chicago; Dr. Mildred E. Mathias, of Pittsburgh, Pa., research associate New York Botanical Garden; Dr. T. H. Kearney, principal physiologist, Bureau of Plant Industry, Washington; Prof. H. I. Featherly, associate professor of botany and plant pathology, Oklahoma Agricultural and Mechanical College, Stillwater; Mr. Leonard Barron, horticultural editor of "American Home," Garden City, N. Y.; Dr. Masao Suzuki, professor of physiology, University of Tiba, Japan.

Continuing their work on the toxicology of arsenic, Parfentjev and Devrient have published in the JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS, Vol. XLIV, No. 2, pp. 171–189, a paper on "The Action of Arsenic on Leaves." The work was done in the Laboratory of Plant Physiology of the Henry Shaw School of Botany. While the fact that arsenic sprays applied to plants as insecticides frequently caused the so-called "burning," the mechanism of arsenic injuries to leaves has been unknown. The authors as the result of their experiments conclude that the damage is due to the fact that the cells of the leaf tissue lose the capacity to get water from the vessels. In other words, the inability of leaves treated with arsenic to obtain the necessary water is probably due to the loss of some regulator of the water supply mechanism, and is quite distinct from burn-

ing, due to acids or excessive heat from the sun. "The loss of the capacity of dipped leaves to get the water from the plant cannot be attributed to the action of arsenic on the vessels of leaves, for our experiments with penetration of stain showed that the vessels of the leaves treated with arsenic solution do not become less but even more conductible for the water."

STATISTICAL INFORMATION FOR JUNE–AUGUST, 1932

GARDEN ATTENDANCE:

Total number of visitors in June	25,641
Total number of visitors in July	27,506
Total number of visitors in August	33,945

PLANT ACCESSIONS:

Total number of packets of seeds donated in June	27
Total number of bulbs donated in June	50
Total number of plants and packets of seeds donated in July	117
Total number of plants and packets of seeds donated in August	65

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June	72
Total number of books and pamphlets donated in June	302
Total number of books and pamphlets bought in July	26
Total number of books and pamphlets donated in July	86
Total number of books and pamphlets bought in August	23
Total number of books and pamphlets donated in August	87

HERBARIUM ACCESSIONS:

JUNE

By Purchase—

Jones, Prof. Marcus E.—Plants of California, Texas, Arizona, and Mexico	235
Mexia, Mrs. Ynes—Plants of Mexico and Brazil	637
Tharp, Prof. B. C.—Plants of western Texas	330
Weigel, Theo. Oswald—Plants of Chile, collected by E. Junge	25

By Gift—

Allen, Miss Caroline—*Halenia deflexa* (Sm.) Griseb. from Vermont	4
Britton, Dr. N. L.—Plants of Porto Rico	5
Cockerell, Prof. T. D. A.—Fungus from Belgian Congo	1
Featherly, Prof. H. I.—Plant of Oklahoma	1
Mexia, Mrs. Ynes—Miscellaneous plants of Mexico	15
Perry, Miss Lily M.—*Lemanea* sp. from Missouri	1
Pinkerton, Miss Elizabeth—Plants of Missouri and New York	80
Wheeler, Louis C.—*Chorizanthe* of California	7

By Exchange—

Moore, John Adam—Plants of Missouri	4
Total	1,345

JULY

By Purchase—
Aellen, Dr. P.—Plants of Switzerland..... 100
Broadway, W. E.—Plants of Trinidad and Tobago..... 121
Gunkel, Dr. Hugo—Plants of Chile..... 100
Moore, John Adam—Plants of western United States.... 212
Weigel, Theo. Oswald—Hamel, M. G. and A. Hamel-Joukov, "Algues des Antilles Francaises," Fasc. II, Nos. 51–100, inclusive..... 50

By Exchange—
Botanical Museum (Herbarium), Munich—Ferns of Assam, India, and of Venezuela..... 24
U. S. National Herbarium—Plants of California and New Mexico, collected by W. W. Eggleston..... 127

By Transfer—
Moore, G. T.—*Phragmopedilum caudatum* var. *Warscewiczianum*, collected in Panama by G. H. Pring and brought to flower in greenhouse at Missouri Botanical Garden 1

Total..... 735

AUGUST

By Purchase—
Steyermark, Julian A.—Plants of eastern United States.. 936
Thompson, J. William—Plants of Washington..... 662
Valeur, E. J.—Plants of Santo Domingo..... 146

By Gift—
Bettis, Mrs. James R.—Plant of Missouri..... 1
Kellogg, John H.—Plants of Missouri, collected by B. F. Bush in 1932..... 88
Ledman, O. S.—Plants of Missouri..... 3

By Exchange—
Conservatoire et Jardin Botanique, Geneva, by Dr. B. P. G. Hochreutiner—Plants of southern Europe..... 166
Field Museum of Natural History—Miscellaneous duplicates 230
Gray Herbarium, Harvard University—Plants of Panama and Brazil 6
Jardin Botanique Principal, Leningrad—Plants of Central America 3
U. S. Department of Agriculture, Bureau of Plant Industry—Wier's Brazilian Polypores..... 47
U. S. National Museum—Plants of western United States, collected by W. W. Eggleston..... 80
University of California—Willows of California..... 301
Vienna Natural History Museum—Plants of Europe.... 162

Total.....2,831

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies. Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
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Mycologist

JESSE M. GREENMAN,
Curator of Herbarium

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Research Assistant

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TROPICAL STATION, BALBOA, CANAL ZONE

A. A. HUNTER,
Manager

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

Vol. XX OCTOBER, 1932 No. 8

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ST. LOUIS, MO.
1932

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OF THE MISSOURI BOTANICAL GARDEN

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1. AMORPHOPHALLUS RIVIERI (DEVIL'S TONGUE) 2. CRINUM MOOREI
3. GLORIOSA SUPERBA 4. CRINUM ASIATICUM × C. AMABILE (HYBRID CRINUM)

Missouri Botanical Garden Bulletin

Vol. XX OCTOBER, 1932 No. 8

BULBOUS PLANTS FOR ST. LOUIS

Interest in the growing of various bulbous plants has been gradually increasing among amateurs in St. Louis. This is evidenced by the numerous requests coming to the Garden for special information as to how to handle an unusual bulb which the grower is attempting to establish for the first time. Mr. A. G. Ulrich has probably had more practical experience in growing a wider range of bulbs under ordinary back-yard conditions than any other person in St. Louis. He has consented to bring together for the benefit of the amateur the results of his years of trial, and in some cases tribulation, which we are sure will be of great benefit to those wishing to try growing some of these interesting plants. His article follows:

"When a boy my vacations were spent with my grandmother, in St. Charles County, Mo., in an old-fashioned garden overlooking the Missouri River. My uncle specialized in roses. The only kinds in those days were hybrid perpetuals, very few of which are obtainable to-day. We lived on what is now Eleventh Street, near Chouteau Avenue. Our garden was about one hundred and fifty feet by three hundred feet. When a friend presented me with a bulb of *Amaryllis Johnsonii* and one of *A. rutilum,* I began to specialize in bulbs. We resided many years on Washington Avenue, where most of my work in hybridizing was done. My collection was next moved to the present location on

Arsenal Street. My interest in growing things is as firmly rooted as ever. I am pleased to pass on to others the knowledge and experience gained during these many years of growing plants, the most fascinating hobby on earth.

"*Agapanthus* (African lily).—From *agape* meaning love, and *anthos,* flower. Family Liliaceae. These are handsome tuberous-rooted plants flowering in the summer, of easy culture, but require a soil of sod, leaf mould, rotted manure, and some sand. They are best grown outside in large pots or tubs. In the fall, before frost, remove plants to indoors and water moderately. During the summer water freely—they are very thirsty. Manure water may be given previous to flowering. They increase rapidly with intelligent care and can be divided in the spring if necessary.

"*A. umbellatus* (umbeled).—Two to three feet tall; bright blue flowers, many in the umbel.

"*A. albidus.*—A white form of the above which requires careful ripening off.

"*A. maximus.*—Larger, bright blue flowers, immense umbels; a noble plant when well grown.

"*Amaryllis* (*Hippeastrum*) *Johnsonii.*—Family Amaryllidaceae. This Amaryllis is a cross between *Hippeastrum Reginae* and *vittatum,* and was first raised by a watchmaker of Prescot in Lancashire, named Johnson, for whom it was named. It is easily obtained through any dealer, and in Texas is grown by the thousands. There is some doubt as to whether the *Johnsonii,* sold as such, is really the one originated by Johnson in the year 1799. However, the grower is hardly interested in this controversy, and it suffices to say that the plant is very interesting and easily grown and flowered. The flower is a brilliant scarlet, with a white stripe through the center of each petal. A large pot full is a beautiful sight. The plant requires a good sod soil, with about one-third cow manure and some sand. It has a season of rest, when water should be sparingly given—just enough to keep the leaves from flagging. It usually blooms in the early spring. The first sign of life is the flower bud, which should be increasingly watered as it grows. In the summer the plant should be plunged in the soil in

a half shady place in the garden and left until September or thereabouts. It should then be taken indoors and placed in a window or other good location. Offsets are formed profusely and may be left to increase and mature until they fill a large pot. To propagate, the offsets should be removed when they are of a reasonably good size and potted separately. Do not use too large a pot, as Amaryllis prefer to be pot-bound. Annual repotting is not necessary—merely remove some of the top soil each spring and replace with fresh. Liquid cow manure in summer is very beneficial if applied about every two weeks.

"*Amorphophallus Rivieri* (devil's tongue, snake palm).—Family Araceae (Arums). A giant aroid from the eastern tropics, and the most useful species of the genus. If the bulb is of large size the flower is produced in early spring without roots or leaves. It is about three feet high and resembles a huge calla lily, but is remarkable for its strong and disagreeable odor, which attracts all sorts of flies and insects. The stem is deep green, spotted and speckled with rose. After the flower has withered the bulb may be planted in the garden when all danger of frost is past. The leaves begin to grow immediately, spreading out like a large umbrella. In the fall, after the leaves have ripened, dig up the bulbs, clean them thoroughly, saving all offsets which can be grown on the next year, and store in a dry place at a temperature of about 50° F. This plant is one of the curiosities of plant life, but it is sparingly offered and the price is rather high.

"*Chionodoxa* (glory-of-the-snow).—From *chion* meaning snow, and *doxa,* glory, referring to the habit of flowering in the melting snow in their native habitat. Family Liliaceae. A small genus of hardy spring-flowering bulbs. They succeed best in a soil mixture of loam, peat, and sand, and must be planted in the fall, about two inches deep. In favorable positions they multiply rapidly and are among the most interesting and beautiful bulbs flowering in the early part of the year. The following named kinds are among the best and most satisfactory varieties to grow:

"*C. gigantea.*—Large light blue flowers.

"*C. gigantea alba.*—Large snowy-white flowers. Rare.

"*C. Luciliae.*—Flowers intense blue shading to white in the center, three- to six-flowered. One of the most satisfactory and beautiful species.

"*C. Luciliae alba.*—A beautiful white variety of the former.

"*C. Luciliae rosea.*—A very fine variety with pink flowers.

"*C. sardensis.*—Small flowers lavishly produced, true gentian-blue—a very rich color.

"*C. Tmoli.*—Late bloomer, bright blue and white flowers—makes a wonderful display.

"*Clivia.*—Family Amaryllidaceae. A native of South Africa. Clivias make excellent house plants. They have attractive evergreen foliage at all times and showy red flowers in umbels. When potting, see that the drainage is perfect. Rotted sod soil, crushed charcoal, and cow manure is an ideal mixture for planting. If necessary to repot, do so after blooming. The plants require considerable water when growing, but after growth has been completed keep in a temperature of about 50° F. and give just enough water to keep the leaves from flagging. Too much water produces leaves at the expense of flowers.

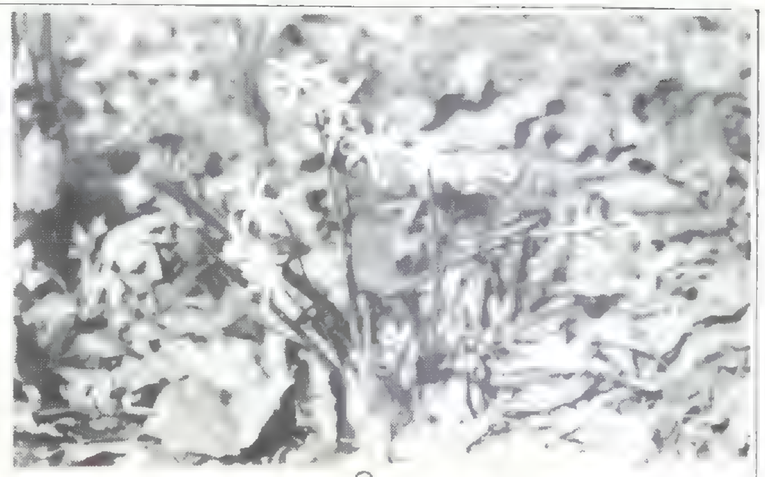
"*C. miniata.*—The showiest and most reliable of the species; introduced into cultivation in 1854. Flowers bright scarlet with yellow throat, twelve to twenty in an umbel.

"*C. nobilis.*—Introduced into cultivation in 1828. Flowers forty to sixty in an umbel, tipped green.

"There are several other species, but the above are the best and most reliable bloomers. *C. miniata* is offered by some dealers at rather high prices.

"*Cooperia* (rain lilies).—Family Amaryllidaceae. Native of Texas and Mexico. There are three important species, *pedunculata, Drummondii,* and *Oberwetteri,* of which the first is by far the best and the largest flowering. Plant out in the early spring, and if the bulbs have been well grown the previous year they will bloom in two or three hours after the first heavy rain, the flowers springing up like magic. They are called rain lilies in Texas, where acres and acres of the pure white flowers form a sight never to be forgotten. They are wonderfully fragrant. After the first frost the bulbs should be dug and dried off for a day or so in a shady

1



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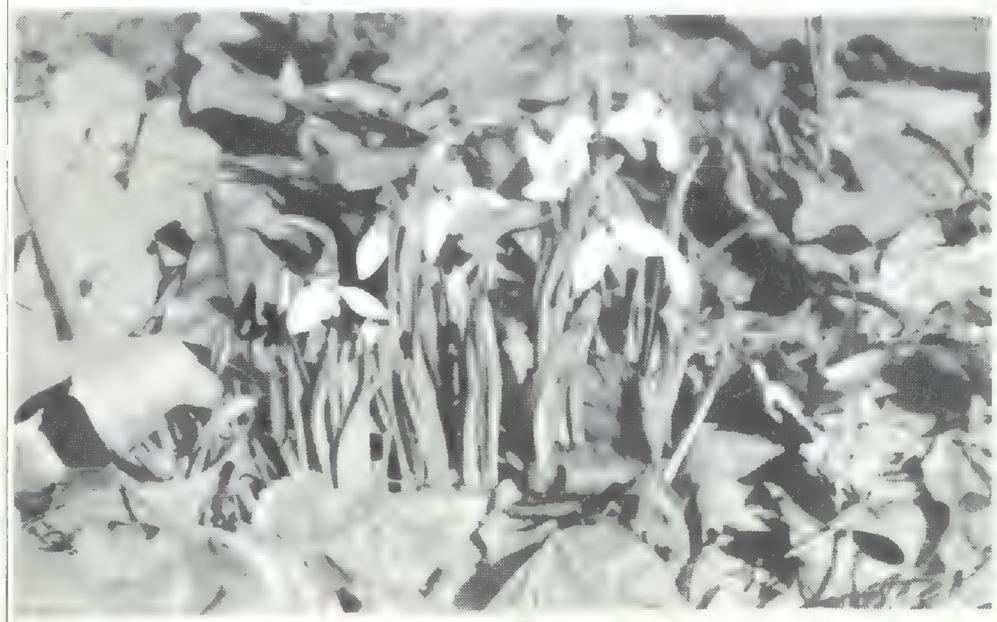

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1. CRINUM LONGIFOLIUM 2. CHIONODOXA SARDENSIS (GLORY-OF-THE-SNOW) 3. GALANTHUS NIVALIS (SNOWDROP) 4. CRINUM YEMENSE

1. HABRANTHUS ADVENUS (SMALL-FLOWERED AMARYLLIS) 2. HYMENOCALLIS CALATHINA
3. HYMENOCALLIS CALATHINA × H. AMANCAES (HYBRID HYMENOCALLIS

place. After that store in paper bags in a dry place, away from the extreme heat of the cellar.

"*Crinum abyssinicum.*—A native of Abyssinia, strikingly different in growth and appearance from other Crinums. It has a beautiful satiny-white, nodding, bell-shaped flower exquisitely fragrant, four to six flowers in an umbel; narrow upright glaucous-green leaves. The plant may be grown in pots or planted out in the garden. Take up the bulbs in the fall and keep perfectly dry in winter in a temperature of about 50° F. This species rarely ever sets seed in my garden, but I have used the pollen freely in hybridizing. It requires a rich soil and plenty of water while growing. This Crinum multiplies slowly and is a fairly good bloomer. It is not for sale in this country, my plant having been purchased from a firm in Italy over twenty years ago. A really worth-while plant and easy to manage.

"*Crinum amabile.*—This Crinum is a native of Sumatra and is supposed to be a spontaneous hybrid. The bulbs are sold in Florida under the name of *angustum,* which also is a similar natural hybrid. Flower wonderfully fragrant, crimson band in center, outside tinged with purplish red, twenty to thirty flowers in an umbel. This is an evergreen plant and so must be kept growing. It is very large and rather difficult to manage except in Florida gardens where it is hardy, but is strikingly beautiful and well repays any special trouble to bring it to bloom. It requires a large pot, rotted sod soil, cow manure, and some charcoal. Annual repotting is not necessary, but a top dressing of fresh rich soil should be given annually, also an occasional feeding with liquid manure.

"*Crinum americanum.*—A native of Florida, growing abundantly in marshes and river swamps. The flowers bloom in June and later, three to six in an umbel, very fragrant. While in Florida some years ago I had the good fortune to see thousands of these Crinums in bloom in the Lake Apopka region. Their fragrance was overpowering and the sight was inspiring. Thousands of the bulbs are collected annually and sent to all parts of the country. They multiply by means of stolons, or underground runners, which send up sprouts, forming new bulbs often three

or more feet from the parent bulb. As pot plants they are not much of a success, probably on account of the peculiar conditions under which they grow and their method of multiplying. At any rate they are worth trying.

"*Crinum asiaticum* var. *sinicum*.—This Crinum is offered in the South under the name of *pedunculatum*. The two species look and grow very much alike, but *C. asiaticum* is a native of Asia, while *pedunculatum* is from Australia. The flowers of the Australian species have more substance and the leaves are more upright. In Florida and other southern states *C. asiaticum* is found growing in cities between the curb and sidewalk, and huge bunches of the flowers are often seen in the stores in vases. Flowers twenty to fifty in an umbel, spidery in appearance, fragrant. The plant is of large size and requires large pots. The bulb hardly ever produces offsets, but usually divides into two of equal size. Grow the bulbs in rich soil and give plenty of water while growing. Remove them indoors before frost without drying off; they must be kept moist during the winter. The plant has been used freely in hybridizing. A very ornamental and reliable bloomer.

"*Crinum giganteum*.—Found in central and west tropical Africa, and introduced into cultivation in 1780. Flowers pure white, four to six in an umbel, with a strong vanilla-like odor; bloom in summer. Why this plant ever was named *giganteum* is a puzzle. Perhaps the flowers suggested the name, for they at least are large. Plant the bulbs in a good-sized pot of rotted sod soil, peat or leaf mould, and cow manure, with some charcoal. They require plenty of moisture and like the shade of a tree. This is an evergreen plant and should be kept growing at all times. A top dressing of rich soil given annually, instead of repotting, is all that is necessary for several years. I have used the pollen in hybridizing; it sets seed readily. A beautiful flower, and really worth having. Offered by growers in Florida.

"*Crinum lineare*.—A native of South Africa. Flowers blooming from June to October, five to six in a slender umbel about a foot long, very fragrant, white with pale rose markings. Keep the bulbs dry in winter in a cool atmosphere. Plant in the spring in a soil composed of loam,

sand, and cow manure. A very pretty plant and worth growing but stingy with its flowers. My plant was imported from Italy.

"*Crinum longifolium.*—Native of South Africa from Cape of Good Hope to Natal. It is hardy in St. Louis with slight protection and should be planted in the garden. I generally dump coal ashes over the clumps, removing them in the spring. Compared with other Crinums, the flowers of *longifolium* are rather tame, the value of the plant lying in its hardiness, its adaptability to our climate, and wonderful increase. Flowers six to twelve in an umbel, of two colors, pure white and rosy white, with a dark red stripe on the outside of each petal; leaves glaucous-green. It is a prolific seed bearer, and I have used it a great deal in crossing with other species. In its native habitat it revels in half swampy places. Offered by growers in California, Oregon, and Florida; also called *Crinum capense.*

"*Crinum Moorei* and *C. Macowanii.*—These two Crinums are very much alike in habit and appearance and are among the species easiest to grow. They require large pots, good soil, and plenty of feeding. During the winter they need a resting period, the leaves naturally dying down at this time. Both species have bell-shaped flowers of a pale rose color. *C. Macowanii* has a long, slender neck, and the leaves seem to start at one point, in a spiral form. *Moorei* is more variable; there is a paler and darker variety of rose, also a white form, and a yellowish one; it has a shorter neck and shorter leaves than *Macowanii,* and also forms more offsets. Both species thrive in a half-shady position. A soil composed of about two-thirds good sod soil and one-third cow manure is recommended. Keep the bulbs dry during the resting period. They begin to grow early in the year and require a great deal of water while growing. They may be plunged in soil in the garden in summer. Both plants set seed rapidly and have been used a great deal in hybridizing. Habitat: Natal and Kaffraria.

"*Crinum Powellii.*—This plant is a hybrid between *Crinum longifolium* and *C. Moorei.* There are four different variations in flower color—pink, white, intermediate, and blandum—about eight flowers in an umbel. The bulbs

are about twenty or more inches long and require deep planting, so prepare the location accordingly. In my garden the plant is hardy if given protection. After the first killing frost cover with ordinary coal ashes, hilling up to about twelve or fifteen inches (ashes throw off the moisture and are the most reliable protection for this class of plants). Remove them in March or April. Cow manure, well rotted, incorporated in the soil is a good fertilizer. All Crinums require a great deal of water while growing and blooming. This species multiplies rapidly and blooms profusely. It is offered by some dealers in California.

"*Crinum pratense* (meadow-loving).—Found in India growing on low ground liable to inundation; introduced to cultivation in 1872. Flowers six to twelve in an umbel, white, red stamens, low-growing, blooming in June and July, very fragrant. Plant evergreen, likes a cool temperature. It grows best as a pot plant in a soil mixture of loam, peat, sand, and cow manure, and naturally a great deal of water. Less moisture may be given in winter. An interesting species imported from Italy about twenty years ago, but not much of a bloomer with me.

"*Crinum scabrum*.—Widely spread in tropical Africa. The bulbs are large and should be planted in good-sized pots. A soil mixture of rotted sod soil, leaf mould, and cow manure will insure good growth and bloom. Flowers white, distinctly keeled with bright red, four to eight in an umbel, very fragrant. Edge of leaves scabrous and wavy, this characteristic being noticeable in first-generation hybrids. The plant requires plenty of water when growing. Dry off the bulbs in the fall and keep in their pots in a dry, warm atmosphere during the winter. If necessary they should be repotted in early spring. They bloom in summer and can be removed to a shady place where the flowers will last and show to best advantage. Offered by dealers in Florida.

"*Crinum yemense*.—Habitat: Arabia. This species is comparatively new to cultivation. Flowers eight to ten on a stalk, large, bell-shaped, silvery white, the buds striped with rose, fragrant. The plant requires a mixture of sod soil, cow manure, and a small quantity of peat. Copious watering should be given during growth, and complete rest in

winter in a temperature of about 50° F. Grow in pots of ample size and plunge in the soil in the garden in summer. It is a reliable, beautiful bloomer, and sets seed readily. I have used it freely in hybridizing.

"*Crinum zeylanicum.*—Widely spread in tropical Asia and Africa. It is offered under the name of *Crinum Kirkii* by most dealers. Flowers white with a broad band of red down the back, very fragrant, ten to twenty in an umbel, on a scape tinged with red. This Crinum must be kept in a warm atmosphere and is partly evergreen. Just enough water should be given in winter to keep it from drying off. It blooms in summer, sometimes having two or three scapes in a blooming season. Rotted sod soil, leaf mould, and some cow manure, with plenty of water during the growing season, will insure success with this plant. A very distinct and satisfactory Crinum to grow. It sets seed readily, and I have used it freely in hybridizing.

"*Galanthus* (snowdrop).—From *gala* meaning milk, and *anthos,* flower. Family Amaryllidaceae. Hardy bulbous plants, well-known favorites, displaying their usually solitary milk-white blooms in early spring in a way that appeals to all lovers of flowers. Plant the bulbs in autumn about two inches deep. They may be grown in borders, rockeries, and in the grass. They like a rather moist and cool soil. Do not disturb if they are growing well. The following are among the best species:

"*G. byzantinus* (giant snowdrop).—Broad shiny leaves, large snow-white, globular flowers, early-flowering, sometimes in January. Plant in a protected position.

"*G. Elwesii.*—One of the most beautiful of all snowdrops.

"*G. nivalis.*—Common snowdrop.

"*G. nivalis fl. pl.*—Double snowdrop.

"*G. nivalis maximus.*—Large-flowering.

"*G. nivalis viridis.*—Green-tipped petals, large flower.

"*G. plicatus.*—The great Crimean snowdrop; broad leaves, large globular, white flowers.

"*Gladiolus* (sword lily).—Family Iridaceae. The genus contains about ninety or more species, nearly all of which are native of South Africa. The species formerly seen in our gardens have disappeared except in botanical collec-

tions, and the gladioli that claim most of our attention today are the hybrid forms and their descendants. No plant has been so much improved by hybridization as the gladiolus. The labor of cross-fertilizing is so slight in comparison with the results that thousands of varieties have been produced and named. Most of the earlier hybrids have long since ceased to exist, their places being filled by the more beautiful forms, and the plants are still being improved. Seemingly there is no limit to the wonderful changes that can be produced.

"The corms may be put in the ground as soon as it is in condition, since a little frost does not injure them. The gladiolus will thrive in light loam or a moist sandy soil. Cover the corms about four inches with soil which should have been manured the previous year. Do not replant in the same location for at least three years, for disease always follows repeated plantings in the same location. Reserve the larger corms for late planting; they bloom earlier than the smaller. During July and August the sun seriously affects the flowers, the spikes being shorter, the blooms smaller and not lasting long. In fall, when the leaves begin to turn yellow, they should be cut off, the corms dug, dried in a shady place, and the different kinds placed in paper bags. Before storing remove the old corm adhering to the new one. Store in a cellar in a temperature of about 40 to 50° F. In this climate the *primulinus* hybrids seem to do best. They rather prefer a hot temperature, but require a great deal of water. The stalks should be cut and brought into the house when one or two flowers have opened; all the remaining buds will open and the beautiful colors will show to advantage.

"*Gloriosa.*—Family Liliaceae. A native of South Africa, commonly called climbing lily, but having only a small claim to the name of lily. It is a handsome plant of sub-climbing habit, somewhat resembling *Lilium philadelphicum*. A slight trellis to support it is necessary. Flower colors bright orange and yellow. The plant requires a mixture of one part sod soil, one part leaf mould or peat, and some sand. After finishing their growth, the bulbs must be dried off, leaving them in their pots until early spring, when they

are repotted. I then plunge them in soil in full sunshine, sinking the pots to the rim. A very interesting and satisfactory plant increased by offsets and seeds. *G. superba* is the only species offered in this country. When the flowers first appear they are disappointing because of the predominance of green, but the color soon changes to bright orange.

"*G. Rothschildiana.*—Larger and brighter flowers than *G. superba.*

"*G. superba.*—The most popular species, slender, tall, and showy.

"*Habranthus* (small-flowered Amaryllis).—The plants formerly placed in this genus are now included under Hippeastrum. They have narrow foliage, small flowers, from one to six on a hollow scape about a foot high. They resent pot culture and must be planted in the open border, where they can be protected. I have had some of them for years planted between the roses. Our winter does not affect them until along in December. They bloom in the months of August and September, after which their foliage is perfected. In spring when the protection is removed they make another leaf growth, gradually dying off in June or July.

"*H. advenus.*—Bright red. A native of Chile.

"*H. coccineus.*—Dark red. A native of Chile.

"Hybrid form.—Parentage *advenus* × *coccineus.* Very reliable and a good multiplier.

"*H. roseus.*—Bright rose. A native of Chile.

"*Hymenocallis Amancaes.*—Family Amaryllidaceae. This is the so-called sacred flower of the Peruvians, which the natives honor every year on the 24th of June by holding a kind of religious ceremony. They proceed to the Hill of Amancaes, near Lima, which, though usually bare of vegetation, is then yellow with the flower of the Amancaes. Returning home, they decorate themselves and their horses with the flowers.

"With me the plant grows very slowly, and the original six bulbs which I purchased over twenty years ago have never had an offset and the flowers never set seed, although I have used the pollen for hybridizing in a very limited way. Plant out the bulbs in spring after danger of frost,

and take up in the fall, storing in a dry, frost-proof room or cellar. The only yellow-flowering Hymenocallis; very scarce and seldom offered for sale. This is a beautiful flower, wonderfully fragrant, three to six flowers in the umbel.

"*Hymenocallis* (*Ismene*) *calathina* (Peruvian daffodil, Ismene lily).—This bulb is a native of Peru and Bolivia, and was introduced into cultivation in the year 1794. It is successfully grown by planting out in summer after all danger of frost. It prefers a rich sandy soil in direct sunlight. It may also be grown in a half-shady location, but then the plants often become leggy. The bud usually appears after the leaves begin to grow. Cultivate thoroughly throughout the summer and take up after the first frost, when the leaves are killed, being careful not to break off the thick, fleshy roots. Keep in a dry place in a temperature of about 50° F. until the following spring. The flower is white with a green stripe, very fragrant, from three to five on each scape.

"*Hymenocallis caribaea* (spider lily).—This species is very interesting and ornamental on account of the wonderful purity, fragrance, and elegance of its fantastically shaped flowers. It is a native of the West Indies, but has found a second home in Florida, where it flourishes in every garden. In our climate it is best grown in large-sized pots, using good loam soil with some rotted cow manure and sand. Protect from scorching sunshine. Since the leaves are evergreen, do not dry off the bulbs. They make a new growth after blooming and then require the greatest attention. When danger of frost is past sink the potted plant in soil in the garden, removing to the house before frost. This bulb is offered by dealers in Florida.

"*Hymenocallis concinna.*—This is a very dainty, smaller-flowering bulb, the specific name, *concinna,* meaning neat. Requires the same treatment as *H. Harrisiana.*

"*Hymenocallis Harrisiana.*—This plant is a native of Mexico. It grows freely in a light sandy soil in the open border. The flowers are a beautiful pure white, very fragrant, and readily set seed. I might say that the bulbs I have were raised from seed obtained from a collector in

Mexico. Among the seed sent were two other species that I have never been able to identify. They all look very much alike in flower, but the foliage is entirely different. Dig the bulbs in the fall after they begin to dry off, and store in a dry frost-proof cellar, away from extreme heat, in a temperature of about 50 or 55° F.

"*Hymenocallis littoralis* is a plant requiring the same treatment as *H. caribaea*. It has narrower foliage than *caribaea* and makes an excellent pot plant.

"*Hymenocallis macrostephana*.—This is probably the handsomest species of the whole genus, supposed to be a natural hybrid between *H. speciosa* and *calathina*. Flowers six to ten in an umbel, pure white. The bulbs must be planted in pots in a rich soil and kept evergreen, watered moderately in winter, at which time they rest. If the plants have been well grown, the flowers appear in early summer. They are very fragrant and well worth any extra care to grow. Scarce and not offered for sale.

"*Kniphofia* (red-hot-poker plants, torch lily, flame flower).—Family Liliaceae. Handsome and very distinct perennials which are prevented by severe winters from becoming very popular. *Kniphofia* (sometimes called *Tritoma*) *Uvaria* is about the oldest species and one of the best for garden culture. About 75 per cent of the garden varieties are traceable to it. It begins to flower in late summer and lasts for many weeks.

"*Kniphofia Pfitzeri* (ever-blooming).—One of the best varieties; a great bedding plant. The flowers are a rich orange-scarlet, free-blooming, very showy, good for cutting. The plant succeeds in a good garden soil and may be planted in masses or singly in the border. I protect it by dumping coal ashes over the crowns, removing them in March or a little later.

"*Leucojum* (snowflake).—Family Amaryllidaceae. Ornamental hardy bulbs natives of central Europe and the Mediterranean region, rarely seen in cultivation. They require an open, rich soil with the addition of a little peat or leaf mould; adapted for naturalizing. They somewhat resemble the snowdrops in general appearance.

"*Leucojum aestivum* (summer snowflake).—Flowers pure white, each petal marked with green both inside and out—four to eight flowers in drooping clusters. A very pretty plant which requires same culture as *L. vernum*. Not offered by dealers at the present time. Habitat: central and southern Europe.

"*Leucojum vernum* (spring snowflake).—This is obtainable through some dealers, but is rather sparingly offered. It is a very handsome species, and large clumps of the plant are a wonderful sight. Flowers white with a green spot on the tips of the petals, drooping and fragrant. Plant the bulbs in the fall, about four inches deep. Protect them during the first year.

"*Lycoris squamigera* (*Amaryllis Hallii*).—Family Amaryllidaceae. Habitat: Japan. Leaves appear early in spring, mature in June. The plant blooms in August, without leaves, the flower scape appearing suddenly and in a few days attaining a height of two to two and a half feet. Flowers rose-lilac, fragrant, four to seven in an umbel. A large clump of these plants in bloom is a magnificent sight. Do not interfere with or damage the leaves. It is absolutely necessary that they grow and die back naturally, otherwise there will not be any flowers in August. The plant is perfectly hardy in this climate, but requires about two years to become established. The shock of transplanting is great, and furthermore the bulb is received without roots, which tends to weaken the first year's growth. Bulbs sparingly offered and price remains rather high.

"*Montbretia*.—Family Iridaceae. Showy bulbous plants which may be planted out in the garden in spring. South of Washington, D. C., they are hardy with protection. I have had them for years but protect them thoroughly. They also can be treated like gladiolus, that is, the bulbs taken up in the fall when growth has been perfected and stored in peat or sphagnum to protect them from becoming too dry. Some of the newer hybrids are wonderful, about twice the size of the older named kinds. They like a sunny but not too dry situation in the garden. When they begin flowering unsatisfactorily divide them, planting in some

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1. LEUCOJUM VERNUM (SPRING SNOWFLAKE) 2. HIPPEASTRUM (HYBRID AMARYLLIS) 3. HYMENOCALLIS HARRISIANA 4. LYCORIS SQUAMIGERA (HARDY AMARYLLIS)

1. MUSCARI BOTRYOIDES (GRAPE-HYACINTH) 2. SCILLA SIBIRICA (SQUILL) 3. TIGRIDIA PAVONIA var. GRANDIFLORA (TIGER-FLOWER) 4. SCILLA CAMPANULATA (SPANISH BLUE-BELL)

other position in the garden. The following named kinds will give unusual satisfaction:

"*M.* 'Goldfinch'. — Blooms late; flowers canary-colored, with small maroon blotches at center, outer petals heavily shaded cherry-scarlet.

"*M.* 'His Majesty'.—Very tall; flowers golden-yellow in the center, crimson-scarlet at outer portion of petals.

"*M.* 'Marjorie'. — Late bloomer; flowers golden-orange, canary center with crimson blotches, reverse of petals flushed scarlet.

"*M.* 'Princess May'.—Early bloomer; flowers orange-scarlet, suffused rose, center primrose-yellow, crimson blotches.

"*M.* 'Queen of Spain'. — Early bloomer; flowers deep golden-orange, rose markings at eye.

"*M.* 'Una'.—One of the best. Flowers orange-colored, reverse of petals crimson-bronze.

"*Muscari* (grape-hyacinth). — From *moschus* meaning musk, alluding to the odor of the flowers. Family Liliaceae. Very pretty and interesting bulbs adapted for planting in the border and naturalizing in sunny spots, many of them delicately perfumed. They multiply rapidly in a rich, light soil, and may be grown in the same spot for years. They are absolutely hardy, but an annual top dressing of fresh soil in the spring may be advantageously given. The following are adapted to this climate:

"*M. armeniacum.*—Early bloomer; flowers large, deep cobalt-blue, many spikes.

"*M. azureum.*—Flowers bright blue, blooming very early.

"*M. botryoides.*—Blue grape-hyacinth.

"*M. botryoides album.*—A fine white variety of the above.

"*M. botryoides carneum.*—Flesh-colored flowers.

"*M. comosum.*—Tassel hyacinth; upper flowers greenish purple.

"*M. elegans.*—Flowers in spikes, dark purplish blue with a narrow white edge, upper flowers pale blue. Fine.

"*M.* 'Heavenly Blue'. — One of the best and most satisfactory. Bright clear blue flowers.

"*M. micranthum.* — Bright cobalt-blue flowers, many spikes; late-flowering.

"*M. moschatum flavum.*—Purple turning deep yellow.

"*M. moschatum major.*—Purple turning pale yellow.

"*M. moschatum minor.*—Musk hyacinth, grayish purple.

The three preceding musk hyacinths are deliciously perfumed.

"*M. neglectum.*—Blackish blue; free-flowering.

"*M. paradoxum.*—Large spikes of blackish blue flowers tinged inside with green.

"*M. plumosum.*—Flowers in May; curious feathery plumes of violet flowers.

"*M. polyanthum.*—Large blue flowers.

"*M. polyanthum album.*—A fine white form of the preceding.

"*Scilla* (squill, wild hyacinth, blue-bell).—Family Liliaceae. Beautiful spring-flowering bulbs, native of the colder parts of Europe and the Alps. They all flower in spring and require the simplest culture. Plant in autumn a few inches deep, in good garden soil, not too heavy; can also be naturalized in favorable positions. When established, they do not need to be disturbed for years. A slight yearly top dressing of manure is beneficial. Beautiful blue, rose, or white flowers. The following are all worth growing:

"*S. bifolia* (two-leaved).—Deep gentian-blue flowers, four to six inches long, on a spike; bloom in March. Plant in a warm, sunny spot in the garden.

"*S. bifolia alba.*—Small spikes, creamy white flowers. Very charming.

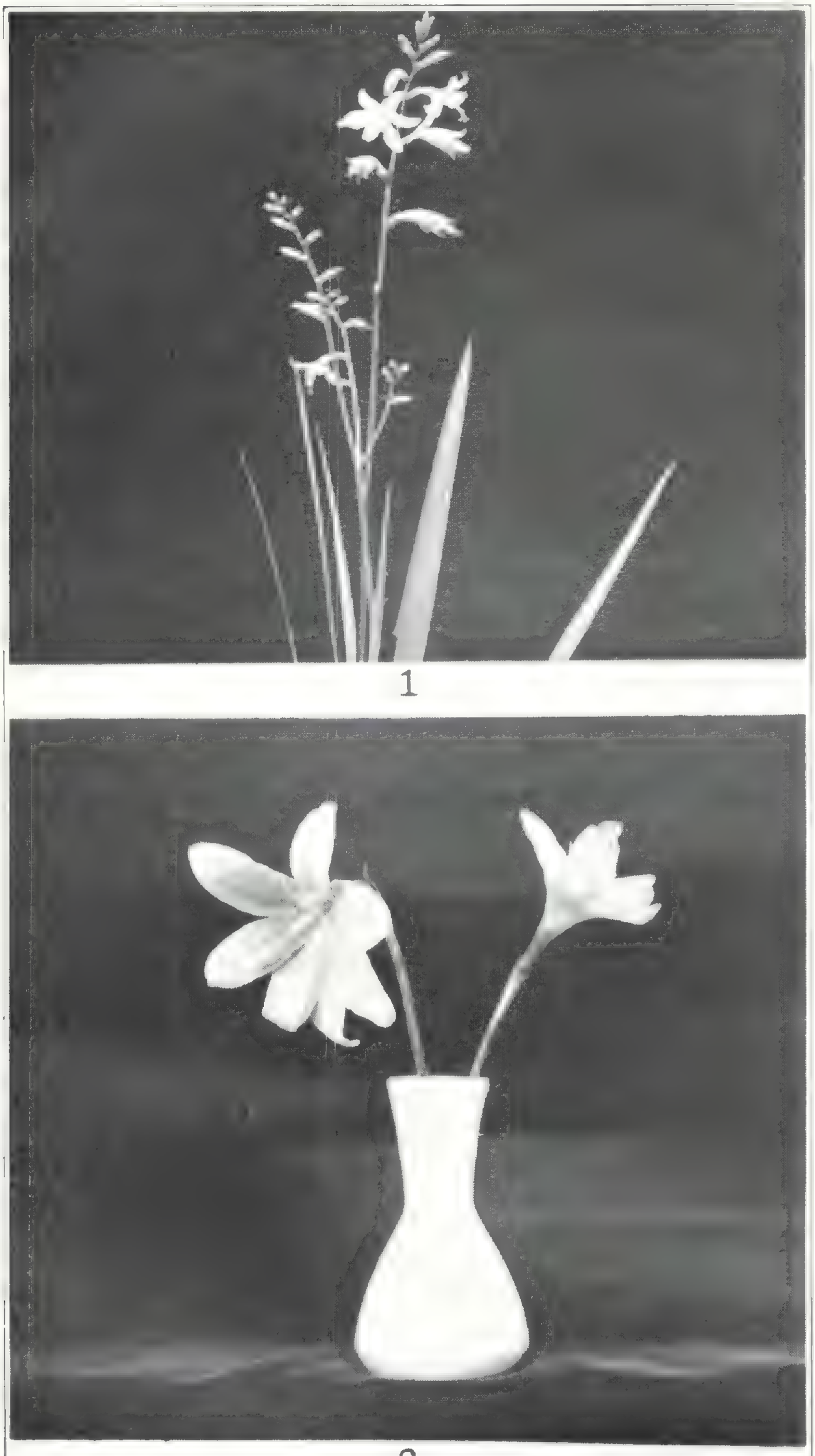
"*S. campanulata* (large or Spanish blue-bell).—One of the finest of early summer bulbs and very hardy and robust; may be planted in the shrubbery borders. Strong pyramidal racemes of large, pendant, bell-shaped flowers of blue, white, and pink.

"*S. nutans* (wood hyacinth or blue-bell).—Purple, blue, white, and pink flowers. Plant shows up well in shrubbery borders; of easy culture, multiplying rapidly.

"*S. pratensis* (meadow-loving).—Deep blue flowers blooming in May. A handsome and very satisfactory plant.

"*S. sibirica* (Siberian).—Bright blue flowers. One of the most interesting and satisfactory species.

"*S. sibirica alba.*—A pure white form of the preceding.



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1. MONTBRETIA HYBRID "HIS MAJESTY"
2. ZEPHYRANTHES CARINATA (ZEPHYR LILY

"*S. sibirica atrocoerulea.*—Flowers very deep blue, tall and large spikes.

"*S. sibirica azurea.*—Light blue flowers. A distinct and beautiful plant.

"*S. sibirica taurica (multiflora).*—Bright clear blue flowers. Very early bloomer.

The following are very satisfactory:

"*S. alba maxima.*—Large white flowers.

"*S.* 'Excelsior'.—Very tall; large deep blue bells on spikes.

"*S.* 'Rose Queen'.—Very fine pink flowers.

"*S.* 'Sky-Blue'.—True dark blue flowers; late-flowering.

"*S.* 'Blue Queen'.—Porcelain-blue flowers; tall and free-flowering.

"*S. peruviana* (*Clusii*) (the Cuban lily).—Deep blue flowers, large umbels, summer-blooming.

"*S. peruviana alba.*—White flowers like the preceding.

"*S. peruviana* 'Souvenir des Batailles'.—Light blue, large-flowering heads. A very interesting plant.

The three preceding scillas must be well protected against frost and moisture; can be easily forced.

"*Sprekelia formosissima* (Jacobean lily).—Family Amaryllidaceae. Native of Mexico and Guatemala, introduced into Europe in 1593. An old garden favorite, very interesting and worth growing. Flowers brilliant crimson, attractive and oddly formed, one or two borne singly on a hollow scape, usually before the leaves. There is also a lighter-colored variety. Plant the bulbs as soon as the ground is in condition, give them good culture all summer, then take up and store in the cellar in a dry place after the foliage ripens.

"*Tigridia* (tiger-flower, shell-flower).—Family Iridaceae. Habitat: Mexico, Peru, and Chile. Summer-flowering plants bearing one or more very showy flowers in shades of yellow, orange, or purplish, variously spotted. *Tigridia Pavonia* was cultivated in Europe in the sixteenth century. They are tender bulbs and should be given the same treatment as gladioli. Plant in well-drained soil, after danger of frost, two or three inches deep. The flowers bloom in July and August, and last but one day. After digging the bulbs in fall, place in paper bags and store in a dry place

in the cellar away from the furnace, at a temperature of about 50° F. Hang on joists, as mice are very fond of them.

"*Vallota purpurea* (Scarborough lily).—Family Amaryllidaceae. This is an excellent plant for pot culture. Use a small pot and do not shift to a larger pot until the roots have completely filled the small one; requires a good loamy soil. It is an evergreen plant which can be wintered in a light room free from frost, with an occasional slight watering. There is but one species in the genus, and it refuses to mix or hybridize with others of the Amaryllis family, to which it belongs. Flowers are fiery scarlet-red, blooming in the autumn. Not often seen in cultivation but really worth while.

"*Zephyranthes carinata* (*rosea*).—This species is usually catalogued under the name of *Z. rosea,* and why I cannot say. *Zephyranthes rosea* is a species native of Cuba and has a smaller flower paler in color. *Z. carinata* is easily obtained and is very satisfactory when planted out in summer in a location where it can have sun most of the day. Its habitat is Jamaica, Mexico, and Guatemala. The flowers are rose-red, single, three or four inches across. Bulbs often throw up three or four flower scapes. In late fall, just before frost, cut off the leaves about one inch above the neck of the bulb, then dig up the bulbs, drying them off in a shady place for a few days. Keep dry all winter in a temperature of about 50° F. This is one of the most satisfactory Zephyranthes to grow."

NOTES

The members of the Fortnightly Club of Kirkwood were guests of the Gray Summit Extension, October 20.

Mr. Paul A. Kohl, Floriculturist to the Garden, acted as judge at the seventh annual flower show of the Adams School, September 28.

Mr. George H. Pring, Superintendent of the Garden, gave an illustrated lecture on "Orchids" before the Town Club, October 7; and on October 25 he spoke at the Carondelet Y. W. C. A. on "Wardian Case Gardens."

Mr. George H. Pring, Superintendent of the Garden, was one of the judges at the Junior Flower Show at Eureka, Missouri, September 25.

Dr. George T. Moore, Director of the Garden, spoke before the Scottish Rite Club of St. Louis, October 12, on "Why People Visit Shaw's Garden."

Mr. L. P. Jensen, Manager Gray Summit Extension, attended the National Conference on Planning, Parks and Government, Washington, D. C., September 18–24.

The "Garden Digest" for October, 1932 (Vol. 3, No. 4), has reprinted the article "Bubble Bouquets," by Katherine H. Leigh, Assistant to the Director, from the June, 1932, number of the Garden BULLETIN.

The St. Louis Florists' Club held its meeting at the Garden Extension at Gray Summit, October 13. After the meeting Mr. L. P. Jensen, Manager Gray Summit Extension, and Mr. G. H. Pring, Superintendent of the Garden, conducted the members on a tour of the greenhouses and grounds.

STATISTICAL INFORMATION FOR SEPTEMBER, 1932

GARDEN ATTENDANCE:

Total number of visitors.....29,351

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	28
Total number of books and pamphlets donated.....	504

PLANT ACCESSIONS:

Total number of plants and seed packets donated.....	14

HERBARIUM ACCESSIONS:

By Purchase—

Broadway, W. E.—Plants of Trinidad and Tobago.....	150

By Gift—

General Biological Supply Company, Chicago—Lichens of Ontario and Washington.....	14
Herter, Dr. W. G.—Lichens of Uruguay.....	10
Lillingston, Howard E.—*Potamogeton foliosus* Raf. var. *macellus* Fern. from Missouri.....	1
Räsänen, Veli—Lichens of Finland, New Brunswick, and British Columbia	25
von Schrenk, Dr. Hermann—Plants of New York.....	30
von Schrenk, Dr. Hermann—*Grindelia lanceolata* Nutt. from Missouri	1
Steyermark, J. A.—*Lactuca saligna* L. from Missouri..	1

By Exchange—

Demaree, Professor Delzie—Plants of California.....	126
Farlow Herbarium, Harvard University—Xylariaceae, det. J. H. Miller.....	16
Field Museum of Natural History—Plants of Hawaii and of horticulture	43
Total.....	417

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

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REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

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Floral Displays of Special Interest in 1932

ST. LOUIS, MO.
1932

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Missouri Botanical
Garden Bulletin

Vol. XX NOVEMBER, 1932 No. 9

PROPAGATING THE CHINESE MAGNOLIAS

Magnolias have occupied for many years a very important place in the landscape of larger gardens. At the same time they have been effectively used as "specimens" in smaller places and have been planted as far north as the temperature will permit. Since they add so much to the early spring display in the Garden, it was decided that their use could be extended if a sure means of propagation was discovered.

In 1930 all of the eight species growing in the Garden produced seeds, and as usual they germinated very poorly. Grafting and budding have so far produced but few plants, even when related species were used as root stocks. Of many thousands of hard-wood and soft-wood cuttings made in the past few years, less than one per cent have rooted. During this time another method of propagation was tried, which, although requiring more time, produces better plants. This method, called "layering," is simply the pinning of a shoot under the soil until it roots.

Magnolia Soulangeana, which is the most showy species hardy in St. Louis, produces a great number of basal shoots near the ground and is well suited for layering. The operation can be accomplished whenever the shoots are sufficiently flexible to permit bending without breaking, their condition being ideal during the dormant period, from November 15 to May 1 or sometimes later. After selecting a vigorous shoot, a slit (pl. 43, fig. 1) is made about two feet from the

tip and a match or small stick is inserted to keep it open. Instead of cutting, which has its disadvantages, the bark may be completely removed from the lower side, for a space of two inches. The shoot should be bent to the ground, and immediately under the cut surface a hole scooped in the soil to a depth of five inches. The hole is then filled with a mixture of half sand and half peat or leaf-mold. To keep the layer in close contact with the soil a 14-inch heavy wire is bent in a "U" shape (pl. 43, fig. 2) and pressed over the shoot into the soil. The shoot is then bent upright (pl. 44, fig. 1) and tied to a light stake. The sharp bend which occurs at the wire tends to restrict the flow of elaborated food downward and does not interfere with the upward flow of sap. As a result callus, and later roots, are formed at the cut. Since the layers are but a few inches underground, it will be necessary to water them in midsummer and cover with cheese-cloth or slats to give partial shade.

If the layering is done in the winter or spring the layer may usually be separated at the trunk one year later and the new plant moved to the nursery or its permanent position the following fall. Sometimes it will be well rooted (pl. 45, fig. 1) at the end of one year; again three years may be required before it is safe to move. This method, while extremely slow, will produce plants three or four feet high in two years (pl. 45, fig. 2) and each one of these will be ready to flower at that time.

A. P. B.

THE SUCCULENT HOUSE

The following article by Mr. Lad Cutak, in charge of succulents at the Garden, is reprinted from the CACTUS AND SUCCULENT JOURNAL, of the Cactus and Succulent Society of America, of September, 1932. It was accompanied by an excellent picture of the interior of the desert house at the Garden:

"One of the points of interest in the Missouri Botanical Garden is the greenhouses with their exhibits covering a surprising breadth of plant representation.

BENDING AND STAKING

LAYERING COMPLETED

WELL-ROOTED LAYER

LAYERED PLANT SET OUT IN NURSERY. NOTICE FLOWER BUDS.

"And not the least interesting is the succulent house. The succulent collection, though not so large as in former years, is nevertheless the Mecca of thousands of cactus enthusiasts the world over. Interesting, beautiful, and artistic indeed it is, for here is housed a collection of some of the most bizarre and grotesque denizens of the plant world.

"Five years ago, a huge hailstorm damaged the collection to such a great extent that we lost most of our choice plants. The hailstones, as large as baseballs, broke all glass overhead. The falling glass either imbedded itself in the plants or cut them to pieces, and the ensuing rains did the rest. Some of the plants still bear scars of that terrible havoc of 1927.

"Here and there in the collection are scattered numerous rockeries filled with Haworthias, Gasterias, Stapelias, and other South African succulents, all having representative members in this collection. Tall specimens of Euphorbias, Cereus, and Yuccas are placed here and there to break the monotony, and scattered among these are groups of Aloes, Agaves, Dasylirions, and other inhabitants of the dry and arid sections.

"The group of 'Old Man Cactus' draws special attention from the visitors because it reminds them of old men with unkempt flowing hair and beards. The largest one is dubbed 'Grandpa.'

"Another interesting plant is *Euphorbia lactea cristata*, which is about the oddest plant in the collection. There are several of them.

"To the average person botanical names do not mean much, so in addition to the botanical names we have labelled most of our plants with common names—names that appeal to the public, such as 'Dumpling Cactus,' 'Swordfish Cactus,' 'Golf-Ball Cactus,' 'Little Pickles Plant,' 'Hen and Chickens,' etc.

"Sad to say, but due to vandalism and the disappearance of smaller cacti and other succulents, it was necessary to erect a wire fence bordering the walk. But unfortunately this did not stop the depredations and later in the year it became necessary to close the house, opening it only on special occasions. The Desert House is now open again with

the hope that the wave of botanical larceny has subsided.

"The Desert House in Shaw's Garden really exhibits one of the most interesting collections of succulents, and cactus enthusiasts of the country should not fail to visit the collection when in St. Louis, or in the vicinity."

"THE EDEN OF ST. LOUIS— SHAW'S GARDEN"

Under the above title Professor J. D. Butler wrote from Burlington, Iowa, to the "Chicago Evening Post" an account of his visit to Mr. Shaw's garden. This was reprinted in the "Missouri Republican" of December 30, 1872, and is reproduced herewith as it appeared in this paper. It is interesting to note the impression the Garden made on at least one man sixty years ago.

Whether at that time Mr. Shaw intended to "bequeath to the State of Missouri both the garden and a pecuniary fund sufficient to keep it flourishing forever" it is of course impossible to know. Certainly, in his last will and testament he bequeathed the Garden and the major portion of his estate to a board of trustees, and it was not his intention that either the city or the state have any direct control over the Garden.

Another matter of interest is the reference to the number of evergreen trees flourishing in the Garden sixty years ago. "Of the coniferous family there are ninety-nine members and of the pines twenty-nine." Nothing perhaps so vividly demonstrates the great change which has taken place in the atmosphere of the city. With a single exception, all of the pines carefully planted and tended by Henry Shaw have succumbed to unfavorable conditions, and it is only because of the Gray Summit Extension that the Garden can look forward to possessing again a collection of evergreens comparable to the one originally established in the city garden.

Articles similar to the following, referring to the early days of the Garden, have appeared in the BULLETIN as fol-

lows: Vol. 6, pp. 81, 127; Vol. 14, p. 85; Vol. 18, p. 119; Vol. 19, p. 117.

"It was better to go to Rome and yet not see the Pope than to leave St. Louis without visiting Shaw's garden.

"Mr. Shaw, an Englishman by birth, came to St. Louis in 1819, and as a hardware man acquired an independent fortune within five and twenty years. He was one of the few men who knew how to retire from business, and, dedicated to the bettering of their minds, make full proof of the true uses of wealth.

"He first spent about six years in travel, penetrating into all the continents and surveying them leisurely, but studiously. Meantime, however, he had begun to realize the ideal of a garden which from childhood had been his beau ideal.

"He planted his paradise at St. Louis, not merely because he there owned eight hundred acres of land coterminus with the city limits for a mile and a half, but because of the latitude—38° 37′, the golden mean between heat and cold—is the best in America for the most various and vigorous vegetation.

"Already for a quarter of a century his garden has been to Mr. Shaw wife, child, and business, all in one, for he has none of them. All the affection others lavish on families; all the care, shrewdness and energy by which he has secured riches, he has concentrated on his modern Eden. Nor has he forgotten Bacon's advice, that a traveler prick in some flowers of what he has learned abroad into the customs of his own country. In this horticultural endeavor he has spent half a million of our money, and that with more pleasure than he took in earning it. He long ago made his will, bequeathing to the State of Missouri both the garden and a pecuniary fund sufficient to keep it flourishing forever—always open to everybody every day, as it always has been from the beginning. Mr. Shaw has also conveyed to the City of St. Louis a park of 200 acres adjoining the garden. More than a quarter of a million dollars has been expended by the city, under the unpaid direction of Mr. Shaw, for the improvement of this park, which was formally opened to the public last summer. The ground

rent in perpetuity of a hundred acres surrounding the park has been given by Mr. Shaw as a fund for keeping it in good condition.

"Accordingly, I say to the Missourians, as was said to the Romans concerning Caesar:

> **'He hath left you all his walks,**
> **His private arbours and new-planted orchards, ...**
> **And to your heirs forever,—common pleasures,**
> **To walk abroad and recreate yourselves,**
> **Here was a Caesar! when comes such another?'**

"You enter the garden through iron gates in walls of masonry—types of the substantial style which runs through the whole establishment. At one entrance there is a cloak and lunch room for the convenience of parties who wish to linger long. Near another stands the museum with glass cases and herbariums showing the Flora of all countries, wonderful growths of grain, especially from the South Platte in Nebraska, as well as a special library on matters horticultural and botanical. Beside the museum is the country house of Mr. Shaw — a solid but unpretentious edifice, though with a tower like an Italian campanile. Before the door is a disk of such velvet greensward as one seldom sees outside of the twin gardens of England. Next, on the left, we come to an avenue of tall pines, which were Mr. Shaw's earliest essay in gardening. Whenever he looks out of his window

> **'A forest planted by himself he sees,**
> **And loves his old contemporary trees.'**

"A vista walk between the pines leads us beneath an arch inscribed *Arboretum*, onward through the whole tree-garden to a summer-house at its end. We can lose ourselves in the endless errors of a labyrinth; but, if minute philosophers, we shall love best to trace out the insatiable varieties in form and foliage of the same sort of tree. Of the coniferous family there are ninety-nine members, and of the pines twenty-nine. There would be thirty but the stone pine *(Pinus pinea)* the umbrella top of which is so characteristic a feature in Italian landscapes, is wanting. Mr. S. has planted it often, but it has seldom survived even two years. The number of varieties in other trees as oak,

willow, poplar, maple, etc., I have forgotten to inquire but it is much greater than any visitor could observe or remember. I never walk through this motley crowd without feeling that, as Noah gathered together all animals, so Mr. S. has gathered together all trees—from Lebanon to California.

"Another department, the *Fruticetum,* or nursery of *shrubs* of all sorts, is worthy of our study, and a delightful midway station between trees and flowers. Yet I see oftenest and linger longest in the *flower* garden—*Floretum.*

"Here at one point I ascend a tower from which eight alleys radiate. The beds between them are filled each with one special variety of flower. The masses of diversified and well assorted colors, sweeping 'round my height of prospect, form an outlook the eyes love to feast on. Having seen it when every petal was perfect, I saw it again the morning after the first killing frost when all flowers were whitened and beginning to droop.

"Scores of pleasant surprises meet me in my rambles among acres of flowers, but I must pass them all in silence, lest I leave myself no space to speak of the heart and soul of all—the conservatory—the sanctuary into which whatever is richest and rarest of all that fills a fifty-acre garden during summer, is garnered while the snowy deluge sweeps over the earth. This building, mainly of stone, has a front of 210 feet, and at right angles in the rear a wing of 65 feet. It approaches the length of the British palm-house at Kew, which cost £35,000. Its entablature is inscribed 'Glory to God in the highest, on earth peace, good will to men.'

"Throughout the garden, but pre-eminently within the conservatory, I am astonished that all things are in such perfect order. The truth is, Mr. S. knows how everything ought to be done—pays well to have it so done—and is also Argus-eyed to see that it has been so done.

"The king of the conservatory is a *screwpine* which is ready to bore its way through the glassy roof. I suggested to Mr. S. building a dome in the roof for its head to rise into, such as I saw erected at St. Petersburg to accommodate the lofty palms there. His answer was that equable temperature could not be preserved in a lofty room, so that, if

the floor was warm enough for the roots, the ceiling must be overwarm for the topmost bough. Having often wondered at the symmetrical twists of this screwpine, I was unexpectedly reminded of it, by meeting stupendous specimens of the same freak of nature in the Sandwich Islands on the slopes of the volcano Kilauea. I also owe my recognizing the papyrus, or paper plant, beside the sea of Galilee, to my having become familiar in this conservatory with its three-cornered stalk and tufted head.

"In this horticultural palace, with a temperature always uniform like the Mammoth cave, or St. Peters, I behold more multitudinous growths than shoot up naturally in any single region; yes, legacies from all the world. One room, set apart for cactuses, would seem at first sight a hospital for vegetable deformities or the incarnation of nature's delirious dreams.

'All monstrous, all prodigious things,
That fable hath yet figured or fear conceived.'

"Another room is filled with century plants—some with gilt-edged leaves. There is one which is likely to unfold its long-expected myriad florets in a year or two. I did wrong to tell the exultant gardeners that in Honolulu I had seen eight in blossom at once.

"The night before I last walked through the conservatory, being the guest of Mr. S., I was feasted on a fruit almost as rare in our zone as nectar and ambrosia, namely the *Philodendron pertusum*, a blending of pineapple and pomegranate. Another of its names is the *Monstera deliciosa*. I should call it the 'ragged old fogy' because its leaves grow in tatters and its fruitage comes lagging a whole year after its flower.

"The fairy-like scene, where buds, blossoms and fruits flourish at once, and sometimes in social sweetness on the selfsame bough, it is as impossible for words to paint as for them to give the blind an idea of colors. After all, I am glad to see that no flower equals the rose in fragrance, form and color. Others show eccentricity—the rose symmetry. Let, then, the sewing girl who can afford but a

single pot in her window, thank God that hers is after all the peerless floral queen.

"Though the conservatory has charms at all seasons, I love to visit it best at mid-winter. Then

> **'On old Hyem's chin and icy crown**
> **An odorous chaplet of sweet summer buds**
> **Is as in mockery set.'**

"I was there in the cold snap last February. Divided from an arctic winter only by a pane of glass, I stood in the midst of the tropics. The force of contrast could go no further than in this marriage of January and May. The good influence of the garden has been evident from the outset, and grows with the growth of the city. It is more and more a fountain of health, pleasure, and aesthetic culture. The Nebraskans are tree planting and have every spring their Arbor-day, on which a prize is offered to those who set out the most and best trees. If I were one of them I would spend a week in Shaw's Arboretum to learn how and what to plant. The Burlington and Missouri River railroad, who have drawn furrows along their line from Plattsmouth to Fort Kearney, with a view to border it with trees, can hardly start right without they take a lesson in Shaw's garden. Many buyers of land along the railroad will get exempted from land tax by planting trees and hedges. There is no one of them who would not plant to more advantage if he would spend a day in Shaw's garden and borrow a leaf from his experience.

"Yet the Nebraska farmer, however poor, will see no reason to envy the operatives in Shaw's garden. Though paid good wages, many of them have not steady employment, and among the hundreds who have had it there, not ten have ever laid by enough to own land of their own, unless they heeded the charge—Go west."

—*Missouri Republican,*
December 30, 1872.

NOTES FROM THE REPRESENTATIVE IN EUROPE

Pleione humilis (a hardy orchid).—As many people associate orchids with high temperatures, it is well to point out

that a large number of these plants can be cultivated in the atmosphere of an ordinary greenhouse, say with a minimum winter temperature of 45 degrees. Quite naturally, any one who has paid a comparatively high price for a plant feels that it should be treated with extra care and attention, and on that account it is usually given somewhat warmer conditions than are really necessary.

A few years ago, the writer of this note received from India a plant of *Pleione humilis*. Knowing that the species grows naturally at an altitude of 7-8,000 feet, the experiment was made of cultivating it in a roughly constructed glass-house entirely without artificial heat during the winter months. The plant was placed in a shallow pan, with a compost of peat-fibre and sphagnum moss, and suspended about two feet from the roof-glass. In this position it has passed safely through a couple of winters, and has several times been subjected to at least five degrees of frost. The plant has increased considerably in size, and the bulbs are slightly larger than those made in its native home. Early in each year, several charming flowers are produced from the base of the pseudo-bulbs, and indicate that the common name of Indian crocus is by no means inappropriate. According to King and Pantling, *Pleione humilis* is known to the European inhabitants of Darjeeling as the Himalayan crocus.

While the majority of orchids propagate themselves readily by means of seed, this species seems to be an exception to the rule. Collectors have stated that it is rarely found bearing seed-capsules, a possible reason being that the flowers are produced during the coldest period of the year, at a time when bees and other insects retire to the warmer localities of a lower altitude.

But this Pleione readily propagates itself by a method which is of considerable interest. It is a common occurrence for the old bulb to form a tuft of hair-like appendages at its apex, and these, after a few months' development, may readily be discerned as miniature pseudo-bulbs, each with a very small leaf attached. When still comparatively small, these single pseudo-bulbs become detached and scattered. With plants under artificial cultivation many of the tiny

pseudo-bulbs fall upon the surrounding compost, and subsequently make their first roots.

In the case of the plant under the writer's care, two of the old pseudo-bulbs each produced upwards of twenty hair-like appendages, almost all of which in due course fell upon the compost, where they have since made satisfactory progress and are now securely established. During the summer months the numerous erect leaves of these miniature plants cause the compost to resemble a small section of lawn grass; but as the leaves are shed in late autumn the little orchids remain almost unnoticed during the winter months.

G. W.

WINTER COURSE IN GARDENING FOR AMATEURS

Owing to the success of the elementary course in various phases of gardening for amateurs, which has been conducted at the Garden for the past few years, the course will be repeated in 1933. As in 1932, it will commence in January instead of March, since it is believed that the course is of more value when given earlier in the year. The class will meet in the lecture room of the museum building (entrance at Tower Grove and Cleveland Avenue gate) at 3:45 p. m., Tuesday afternoons of each week.

REGISTRATION: It is desirable that registration be made by letter, with check payable to the Missouri Botanical Garden enclosed, as soon after December 1 as possible. Tickets will be ready for distribution on day of first lecture. Registration fees will also be received on January 3 at the lecture hall, at three o'clock.

FEES: The registration fee is $5.00 for each person, and tickets are not transferable.

The outline of the subjects to be discussed follows:

January 3—Brief discussion of catalogues, horticultural magazines, and bulletins. Illustrated lecture and instruction on growing plants from seeds and cuttings. The use of hotbeds and cold-frames.....Kohl

January 10—Trees and shrubs:
Pruning of shrubs at planting time.
Summer and winter pruning of trees and shrubs with rela-

tion to the time of bloom, i. e., trees and shrubs flowering in spring from buds formed the previous season; those blooming in summer on wood made during the current season .....Beilmann

January 17—Practical demonstration (students participating) in growing plants from seeds and cuttings...Fairburn

January 24—General care of trees; the importance of tree surgery and the use of fertilizers.....Beilmann

January 31—Roses. Illustrated lecture.....Kohl

February 7—Lawns:
Seed lawns: Preparation of the soil, seed selection, fertilizers.
Stolon lawns: Methods of planting by means of stolons and plugging.
Lawns and their subsequent care.
Experimental lawn plots.....Pring

February 14—Transplanting seedlings grown from the seed sown on January 17.....Fairburn

February 21—Controlling insect pests. Material to use. Beilmann

February 28—Water gardens. Illustrated lecture.
Construction of pools.
Preparation of soil and planting.
Caring for hardy and tropical water-lilies during growing season.
Propagation by seeds, tubers, leaves.
Breeding.
Winter storage.....Pring

March 7—Demonstration in pruning and spraying, including use of power and hand sprayers and dusters.....Beilmann

March 14—Practical demonstration in the greenhouse of potting seedlings, cuttings, and larger plants.
Preparation of soil for sowing seed outdoors.....Fairburn

March 21—Annuals, perennials, bulbs. Illustrated lecture—
.....Fairburn

March 28—Iris and peonies. Illustrated lecture.....Kohl

NOTES

Dr. W. A. Archer, formerly Botanist at the Estacion Experimental Agronomica, Medellin, Colombia, visited the Garden, November 5.

Mr. G. H. Pring, Superintendent of the Garden, spoke before a meeting of the Concordia Patrons' Association, October 27, on "What to Plant in Your Garden."

Dr. Earl E. Sherff, of the Field Museum of Natural History,

and head, department of science, Chicago Normal College, Chicago, visited the library and herbarium, November 12.

Mr. L. P. Jensen, Manager Gray Summit Extension, gave an illustrated talk before the members of the Garden Club of Gray Summit, November 14, on "Why We Should Have a Garden Contest."

The November number of the ANNALS OF THE MISSOURI BOTANICAL GARDEN (Vol. XIX, No. 4) has been recently issued, with contents as follows: "New or Otherwise Noteworthy Apocynaceae of Tropical America. III," Robert E. Woodson, Jr.; "Some New Spermatophytes from Texas," Julian A. Steyermark; "Coccidioidal granuloma: A Classification of the Causative Agent, *Coccidioides immitis*," Morris Moore; "The Genus Daldinia," Marion Child; "Studies in the Umbelliferae. IV," Mildred E. Mathias; "An Apparatus for the Determination of Carbon Dioxide Production in Physiological Plant Studies," F. Lyle Wynd; "A New Species of Parmelia from Texas," John Adam Moore; "Some Effects of Radiations from a Mercury Vapor Arc in Quartz Upon Enzymes," Harry J. Fuller.

Peculiar effects of a dry summer have been noticed on the large horse-chestnut tree just south of the main gate. The first was the loss of all the leaves early in the season on the largest limb on the south side. Then, a few weeks later after a light rain, the next season's flower and leaf buds began to unfold, with the result that on August 2 the defoliated limb was in full bloom. The weather later turned hot and dry, causing all the tender leaves to brown. Next year's growth will be from lateral buds which did not open this year, and because no terminal buds of the second crop were matured no flowers will appear on that limb next year.

STATISTICAL INFORMATION FOR OCTOBER, 1932

GARDEN ATTENDANCE:

Total number of visitors.....42,840

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	47
Total number of books and pamphlets donated.....	674

PLANT ACCESSIONS:

Total number of plants and seed packets donated.....	20

HERBARIUM ACCESSIONS:

By Purchase—

Gray, Fred W.—Lichens of West Virginia and North Carolina.....	100
Jörgensen, Pedro—Plants of Paraguay.....	167
Weigel, Theo. Oswald—Junge, "Herbarium plantae Chilensis," Cent. I, fasc. III and IV, Nos. 50-100, inclusive.....	50

By Gift—

Deam, C. C.—Plants of Indiana.....	5
Hammerstein, H. H.—*Prunus armeriaca* L. from horticulture.....	1
Steyermark, Julian A.—*Grindelia lanceolata* Nutt. from Missouri.....	7

By Exchange—

U. S. National Herbarium—Plants of Haiti, China, Colombia, etc.....	82
University of Michigan, by Professor H. H. Bartlett—Plants of Guatemala.....	34
University of Montana—*Mentzelia decapetala* (Pursh) Urb. & Gilg from Montana.....	2

By Transfer—

Pring, George H.—Water-lilies from horticulture.....	8

By Field Work—

Greenman, Dr. J. M.—Hepatics and mosses of Missouri.	6
Total.....	462

FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

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REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.

Missouri Botanical Garden Bulletin

Vol. XX DECEMBER, 1932 No. 10

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Floral Displays of Special Interest in 1932

ST. LOUIS, MO.
1932

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OF THE MISSOURI BOTANICAL GARDEN

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1

BALD CYPRESS IN THE SWAMPS OF MISSISSIPPI COUNTY, MISSOURI

2

TRUNK AND FOLIAGE OF A BALD CYPRESS GROWING IN TOWER GROVE PARK, ST. LOUIS

Missouri Botanical Garden Bulletin

Vol. XX DECEMBER, 1932 No. 10

THE MOST INTERESTING TREE IN MISSOURI

In the swamplands of southeastern Missouri is a tree of a very distinctive character—the bald cypress *(Taxodium distichum)*. It is no newcomer, but a true member of the landed aristocracy. The ancestors of the trees now standing, many of which are nearly a thousand years old, once formed dense forests extending over vast tracts of the whole northern hemisphere from Greenland to Mexico and from England and Siberia to Alaska and New Jersey. But that was in the days when the dinosaur was the king of beasts and mighty waves of the Eocene sea beat at the base of the bold headlands near the site of the modern city of Cape Girardeau, Missouri. The sea has long ago retreated, and the headlands have been worn into fertility through millions of years of erosion and decomposition, but in the swamps and lowlands, which are all that remain of what was once the sea, the bald cypress is still thriving. Time has not dealt so kindly with it elsewhere, however, and its once vast realm is limited to-day to the low forests of the Atlantic Coastal Plain of the United States from southern Delaware to the tip of the Florida peninsula, westward along the Gulf Coastal Plain to Texas, and up the lower Mississippi Valley and its tributary bottoms to those of the lower Wabash River.

To-day the bald cypress is one of the noblest forest trees of America. The straight, spire-like trunk, covered with a

soft, fibrous, brownish bark, frequently attains a height of 125 to 150 feet, and taller specimens are not rare. The base of the trunk is usually somewhat swollen, probably as a result of inhabiting the swamps and lowlands, and is ramified by many buttress-like ridges which appear further to support the sturdy shaft (pl. 46, fig. 1). The base of such a typical tree may measure over 30 feet in circumference. Perhaps the most distinctive feature of these trees is the production of numerous woody "knees" projecting from the soil around the trunk, ranging from small snags only a few inches above the ground to slender and irregular cones nearly as tall as a man. These knees are breathing structures which transmit air to the roots in the wet seasons of the year when the lowlands are flooded with water. The foliage is very dense, and consists of many flat needles borne at the end of small twigs, not unlike a miniature palm frond in appearance, imparting an indescribable grace to the stateliness of the shaft (pl. 46, fig. 2). Light yellow-green during the summer, the foliage turns to a rich greenish-bronze in the autumn, and is eventually discarded about a month after the fall of leaves from the neighboring maples, gums, and tupelos. In attempting to describe the majestic appearance of these trees we will do well to repeat the words of William Bartram, the pre-revolutionary traveler in the southeastern United States:

> "The Cupreſſus diſticha (*Taxodium distichum*) ſtands in the firſt order of North American trees. Its majeſtic ſtature is ſurpriſing; and on approaching it, we are ſtruck with a kind of awe, at beholding the ſtatelineſs of the trunk, lifting its cumbrous top towards the ſkies, and caſting a wide ſhade upon the ground, as a dark intervening cloud, which, for a time, excludes the rays of the ſun. The delicacy of its colour, and texture of its leaves, exceed every thing in vegetation."
> (Bartram's "Travels," p. 88. 1794.)

The bald cypress in one of the "conifers," and is classified as a member of the pine family, or Pinaceae, closely related to the redwoods of California, although its method of allowing the foliage to fall at the end of the season is also reminiscent of the larch. Catkins, or staminate cones, are produced in the summer and remain on the tree throughout the winter, where they are very conspicuous hanging from

the bare branches at the top of the tree, looking like a threatening crop of bag-worm cocoons. In the early spring the ovulate or seed cones become apparent, and develop into roughly spherical, woody cones about an inch in diameter.

Ever since the colonization of North America the wood of the bald cypress has been an important source of lumber. The extraordinary quality and permanence of the wood is so well known that it seems quite unnecessary to direct further attention to the excellence of the much-advertised "wood eternal." It is fortunate, indeed, that the trees typically inhabit swamps which are not readily accessible, as it is certain that otherwise they would already have suffered the fate of the hard-wood forests and ultimate extinction.

Thanks to their relatively inaccessible habitats, there are still forests of bald cypress in the swamps of southeastern Missouri. During the past season, in company with a party from the Missouri Botanical Garden, consisting of Dr. C. W. Dodge, Mr. A. P. Beilmann, and Mr. J. A. Steyermark, the writer visited a tract of several thousand acres of lowland in Mississippi County, Missouri, containing an almost virgin stand of bald cypress. In this forest magnificent trees were found having a height of 130 to 150 feet and a diameter above the enlarged, buttressed base of 6 to 10 feet. The age of several of these trees was computed with borings as from 500 to 600 years. This primeval forest is strangely enough an example of the unexpected blessings which occasionally proceed from the law: lumbering operations upon it have been prevented only by court proceedings which have already been in the docket for over a half century! Let us hope that the execution of these magnificent trees will be indefinitely postponed.

It has been said that Kublai Khan was probably one of the first founders of a botanical garden, for ancient records and traditions tell of his acquisition of beautiful trees and flowering plants from the eastern lands of his conquests. Since that time until the present, we might say, lovers of the garden have been seeking out new and beautiful plants from foreign countries and assembling them far from their

native soil. Although it must be acknowledged that botanical exploration has immeasurably benefited us in such a way, still it is true that the search for exotics has frequently led us to forget the many plants nearer home which eminently deserve our cultivation.

Mr. Henry Shaw, the founder of the Missouri Botanical Garden, was such a well-balanced gardener that he could appreciate both the exotic and the native flora, and fortunately was not inclined to pander to the former, as is the case so frequently at the present time not only in private planting but in many of our foremost parks and botanical gardens. He early recognized the stateliness and beauty of the native cypress of the Missouri swamps, and was courageous enough to plant it in large numbers in his estate, "Tower Grove," now represented in the heart of the city of St. Louis by the Missouri Botanical Garden and Tower Grove Park. As a result of his wisdom and foresight, we have ample proof of the worth of the bald cypress as a cultivated tree.

Scattered throughout the Garden and Tower Grove Park are numerous groups of bald cypresses which add a rare dignity to the scene wherever they occur. The climax of their plantings comes in a stately avenue over a half mile in length in the center of Tower Grove Park (pl. 47, fig. 1), where the symmetry and grace of the individual trees blend to form a boulevard of which there are few rivals in the world. Many of these trees were planted eighty years ago by Mr. Shaw, and have attained a height of 75 to 80 feet and a diameter near the base of from 2½ to 3 feet. Such trees are not large when compared with the giant specimens in the swamps, but they have become more symmetrical. The cultivated trees have retained only a suggestion of their lowland habit of buttressing, and only one specimen has remembered to send up a series of small "knees," and those merely a few inches high. St. Louisans should not be unmindful of this collection of trees, which apparently has no counterpart in cultivation anywhere in the world.

The lack of conifers which are able to withstand city conditions has frequently been commented upon. Particu-

1

AVENUE OF BALD CYPRESS, TOWER GROVE PARK,

2

GROUP OF BALD CYPRESS AT ALFRED AVENUE

1

ROTTED INTERIOR OF LARGEST SYCAMORE TREE IN LOWLAND TRACT, MISSISSIPPI COUNTY

2

VIEW OF SOUTH SIDE OF SAME TREE

larly with regard to its smoke-laden atmosphere, St. Louis should prove a rigid test for any tree, and it is here that the bald cypress has shown itself so thoroughly to be master of the existing, trying conditions. It has become perfectly acclimatized to our weather and temperature through untold ages. It is furthermore protected from the smoke menace, one of the unique effects of the modern community, by the deciduous habit of its foliage. Its stateliness and beauty of form and its uniquely graceful foliage rival those of any living tree. Its slowness of growth should be no factor of disfavor, save from the questionable viewpoint of the "mushroom subdivision" and shiftless "landscaping for immediate effect," as trees only a few years old are lovely miniatures of the stately giants to come. Its impressive venerability is by no means its least effective quality. Although nowhere planted to secure its best effects, the bald cypress is occasionally found in parks, and less frequently on lawns and estates elsewhere in the South, notably in New Orleans, Washington, and Baltimore. Good specimens have been observed cultivated in central Michigan, and it is probably hardy much farther north.

To-day the Missouri Botanical Garden is prepared to extend the usefulness of the bald cypress for ornamental planting. Thousands of young trees are growing in the nurseries of the Garden and will be used both to augment the city groups and to establish still more impressive plantings in the new arboretum near Gray's Summit in honor of Missouri's most interesting tree, admired by Henry Shaw nearly a century ago.

R. E. W., Jr.

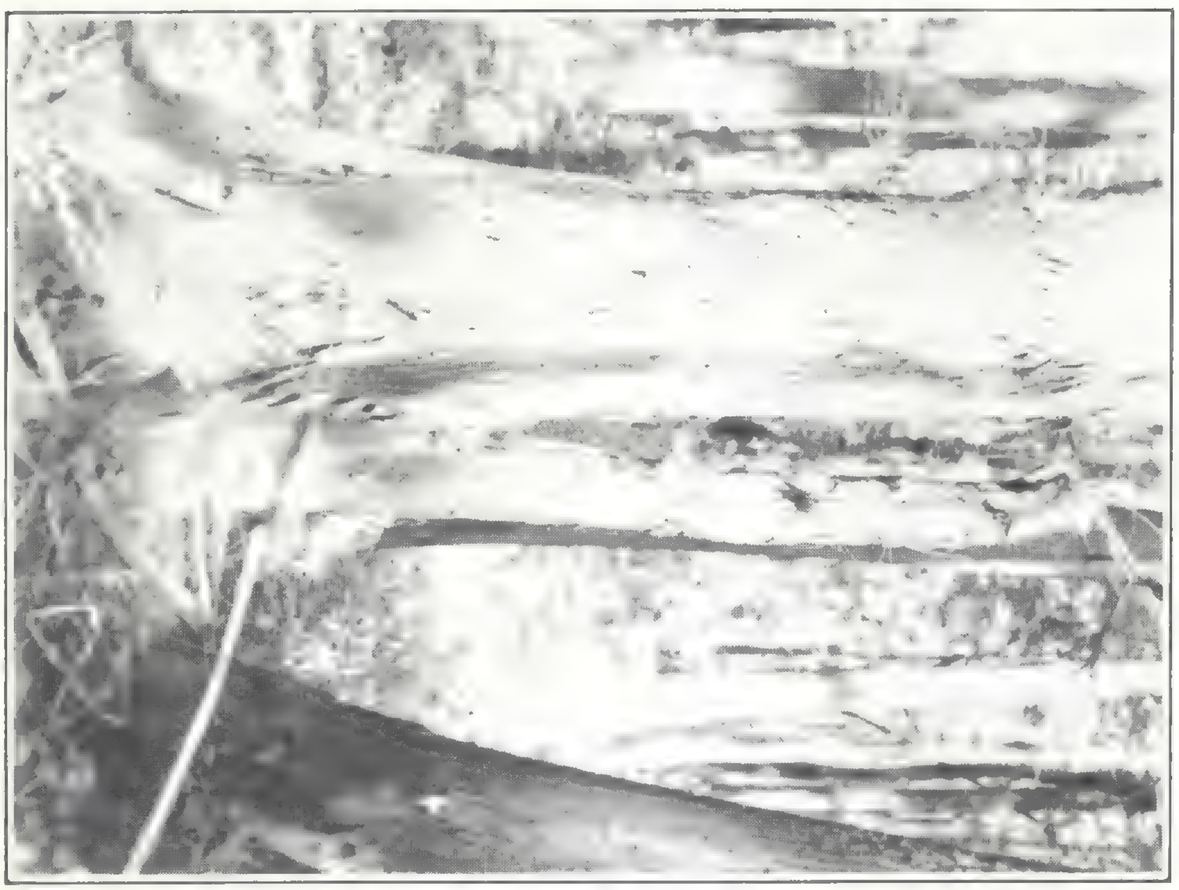
BIG TREES IN MISSOURI

Beyond a doubt, the tract of 36,000 acres of virgin forest in Mississippi County, Missouri, contains the largest trees in Missouri at the present time. The lowland here covers the greater part of two counties and at one time supported giant forests as far north as the headland at Cape Girardeau. At that point the Ozark plateau leaves off and one enters the Bottoms where bald cypress *(Taxodium distichum)* makes its

appearance, each farm wood-lot containing a few in a little hollow. There also the sweet-gum replaces the cottonwood found in the American Bottom around St. Louis.

Upon entering this lowland tract one is struck by the exaggerated growth of all vegetation. Sycamores 4 to 5 feet in diameter are not uncommon along the road. Bald cypress, ash, and several species of oak grow in almost pure stands, interspersed with willow, persimmon, elm, sweet-gum, and a few cottonwoods. The hardwoods grow with clean, smooth boles for 70 feet and are usually far enough apart to admit light for a rank growth of underbrush. The first branches on these trees are as large as mature upland specimens. Under the younger bald cypress light is obscured and the ground is bare. These are still spires like those west of the library in the Garden and in height showed an astonishing uniformity for any particular group—112 feet, 122 feet, 128 feet. The larger trees always had flat tops and were heavily branched, but they were not much taller. The largest living bald cypress measured 17 feet 8 inches in circumference and 139 feet in height.

There seems to be a very definite limit placed on the height to which the bald cypress can grow as a spire, this being also noticed in the farm woodlots. The largest specimen in the small portion of the tract visited measured 26 feet, 8 inches in circumference, but was only 25 feet in height. The top had evidently been shattered by lightning. This must have happened between 50 and 200 years ago, since the portion on the ground was beginning to rot, which in this tree would require many years; also the adjoining trees which must have grown since this tree fell showed no scars and were 3 feet in diameter. Another indication of lapse of time was the absence of buttresses which occurred on all bald cypresses in that portion of the tract, indicating that many feet of sediment had been deposited there since the death of the tree. A count of the annual rings showed that 15 years was required for the tree to gain 2 inches in diameter, and if this rate had been maintained throughout its whole life it would be almost 750 years old. During its youth it must have grown much faster. Since it was killed outright by lightning and there appears to have been no decrease in



1 PURE STAND OF BALD CYPRESS SHOWING SLIGHT "BUTTRESSING" BUT A "KNEE" OVER

2 VIEW TOWARD TOP OF CYPRESS GROVE, SHOWING CLEAN STRAIGHT BOLES

its growth rate we may suppose that rate to be normal for very large trees. The annual rings of two other bald cypresses were counted, and one had taken 208 years to add 2 feet to its diameter, the other 190 years. Increment borings of six other trees 2½ to 3 feet in diameter showed that they grew about 9½ inches in diameter in 54 years. Too much importance should not be attached to these figures, however, for there will be a difference in the thickness of annual rings formed on the north side and those on the south side. This region was at one time under water most of the year, but since drainage canals have been dug in the lowland region water stands there only in the spring. It is quite possible that two annual rings are formed—the first one in the spring because of abundant water, the other later because of better aeration.

The largest tree seen was an oak cut in 1919. The stump was too badly rotted to measure, but its diameter was estimated at 11 feet. The largest live tree was a sycamore 26 feet, 10 inches in circumference. It was completely rotted inside (pl. 48, fig. 1), but it would take many years for fungi to reduce such a massive trunk to a shell. No evidence of the broken top remained. Two large suckers were well over 3 feet in diameter.

From ten years of observation it is evident that in the Mississippi bottoms farther north the succession of trees from the flood-plain willow to the pin oak in the dry bottom can be accomplished in the life span of a man. What is the position of the bald cypress in the succession in southeast Missouri? Will it ever again occur or is this the last appearance? What became of the giants, neighbors of the dead one measured? Not more than 25 sapling bald cypresses were seen, while the hardwoods were abundant. This might be its last occurrence in the succession. A. P. B.

LAWNS OF YARROW

Weeds are no novelty in grass lawns, but the use of a single one of these plants to produce a satisfactory effect is certainly unusual in this part of the country. The establish-

ment in St. Louis of special plantations of the common yarrow *(Achillea Millefolium)* has called attention to the fact that lawns need not always be of grass.

The so-called "scented" lawns of camomile *(Anthemis nobilis)*, a plant which resembles yarrow, were a feature of English gardens as late as the early nineteenth century. Marshall, in his "Introduction to the Knowledge and Practice of Gardening" (1805), gave directions for making camomile carpet walks, and such lawns and walks were popular and described in various books dating back to the seventeenth century. John Evelyn, in his "Kalendarium Hortense," writes: "It will now be good to beat, roll, and mow carpet walks and camomile, for now the ground is supple and it will even all inequalities." Falstaff, in the first part of "King Henry IV," Act 2, Scene 4, remarks: "For though the camomile the more it is trodden on the faster it grows, yet youth, the more it is wasted the sooner it wears." It is even suggested that the lawn on which Drake played his historic game of bowls on the eve of the Armada was of camomile.

Mr. Thomas Hay, Superintendent of the gardens at Buckingham Palace, writes that "there are large areas of camomile surrounding the Palace. No one can say when or why it was planted. While no additions by sowing or planting have been made for the past sixty years at least, it is slowly encroaching on and ousting the grass."

A letter from Messrs. Sutton & Sons, of Reading, England, states:

> "It is evident that while camomile lawns and walks were a feature of English and continental gardens a century or two ago, they are now the exception rather than the rule. A few years ago we carried out an experiment in our trial grounds at Slough with lawns sown with seed of wild thyme, pot marjoram, camomile, and pennyroyal, both individually and in mixture. Our conclusion was that the most satisfactory result was obtained from camomile alone. There was certainly a very pleasant aroma emanating from these plots when walked over, as the bruising of the herbs by treading accentuates the effect of a 'scented lawn.'
>
> "The most economical method of using camomile seed would be to sow a quantity in a cold frame, subsequently setting the plants in the area where it is desired to establish a lawn.

Camomile is, of course, of a creeping character, and the ground is quickly covered; the plants may be set out at intervals of from three to nine inches, and naturally the closer the intervals the quicker will the lawn be formed. It is probable that an ounce of seed would produce sufficient plants to sow an area equal to that of a full-sized tennis court with full margins.

"Concerning yarrow, as doubtless you are aware, this is a common weed of lawns, and is extremely difficult to eradicate owing to its extensively creeping root system. There is no doubt that it possesses a considerable ability for taking hold of the ground, but it is more at home on dry soils than on others; in fact it is doubtful whether it could successfully be established on heavy or wet soils. It is quite true that yarrow is liable to make particularly rapid progress during a dry summer, at the expense of lawn grass, and a similar remark would no doubt apply to camomile.

"We heard of a case last year of one of our customers in the Channel Islands having a lawn consisting of yarrow, the soil being almost entirely of pure sand. Moss had encroached rather badly in this lawn, and it is, in our opinion, very likely that some difficulty would be experienced in keeping the turf clear of extraneous herbage; for instance, there is no doubt that grasses, and possibly clover, would encroach, and weeding would have to be adopted from time to time."

So far as is known, camomile has not been used for lawns in this country, but yarrow has been resorted to with more or less success both for golf links and yards. While the lawns of this plant which have been established in St. Louis are not free from weeds, it must be confessed that they give an even green appearance through a longer season than any grass which thus far has been used for the purpose. Yarrow will thrive on the poorest of soils and its strong roots make an excellent binder for sandy banks. It will stand tramping and under close mowing produces a bright green turf, thick and velvety in appearance and springy to the feet. It is extremely difficult, however, to keep it pure, since grasses and common lawn weeds will creep in.

SOME INCUNABULA IN THE GARDEN LIBRARY

The word "incunabula" might suggest to some people the name of a plant or some other baffling term used in the realm of science, but it really is a bibliographic term applied

to books printed with movable metal types before 1500. The Latin student would recognize the word as meaning "cradles" and might be puzzled as to the connection between cradles and such books. However, when it is realized that the period between 1450 and 1500 represents the cradle period of printing the meaning is obvious. The year 1500 is chosen as the arbitrary date for the end of the "incunabula" or "cradle" period, since by that year the art had become more or less established and experiments had ceased. A certain uniformity had been adopted by 1500, and most of the published books contained a title-page, printer's name, place and date of publication, index, and numbered pages, all of which are very important in identification. The "colophon" at the end of the book often supplied the author's name, name and place of the press, the date (usually a saint's day or according to the Roman calendar), and the year. In French, Italian, or Spanish incunabula one finds the "registrum," which is a list of the signatures used by the binders in arranging the book.

Authorities disagree as to who was the inventor of printing. Some claim it was Coster, of Haarlem, and others that it was Gutenberg, of Mainz. Coster is generally regarded as the first European to print from movable type, but it was Gutenberg who established the art on a lasting foundation. As many writers have pointed out, the invention of printing is not the result of a single inspiration but of a series of experiments in places where people were interested in producing books. Coster's first book from movable type, "Speculum Humanae Salvationis," was printed in 1430, about twenty years earlier than Gutenberg's Bible. With Coster's death, in 1439 or 1440, the production of books from type ceased in Holland, and it is in Mayence (Mainz) that the new art was further developed. Putnam ("Books in the Middle Ages") gives August 22, 1450, as the historical date for the invention of printing. The first work to bear a printer's name and date of publication was a psalter published at Mainz in 1457 by Fust and Schöffer, Gutenberg's successors.

The library of the Missouri Botanical Garden is fortunate in possessing five examples of incunabula. Two of these were in the collection of early herbals, natural histories, and medical botanies presented to the Garden in 1892 by Dr. E. L. Sturtevant, of South Framingham, Mass. (see Ann. Rept. Mo. Bot. Gard. 4:123. 1893)—"Herbarius Latinus," and Crescentiis' "Opus Ruralium"; two—"Macer Floridus" and Barbarus' "Castigationes Plinii"—were included in a large collection of botanical books bought at auction through a foreign dealer in 1902; and the fifth, "Gart der Gesundheit," was purchased through an American dealer in 1923.

[*Herbarius Latinus . Moguntiae, 1484 . Peter Schöffer.*] —This book was printed by Schöffer, the successor of Gutenberg, at Mainz, supposedly in 1484. In the flyleaf of the Garden copy is inscribed "from the library of the late Mr. Arrowsmith, Vicar of St. Pancreas." In 1917 Mr. Arnold C. Klebs, an authority on early herbals, sent a description of the 1484 "Herbarius," to which he appended this notation: "So far as I know this is the only copy of the *editio princeps* in America. It is a larger copy than that in the British Museum, also larger than the inferior Speiers reprint of this work in the Morgan library." Our copy lacks a title-page, and leaf 155 is blank. There is an alphabetical table of herbs and 150 illustrated chapters. Under each illustration is the name of the plant in Latin and German, side by side. At the end is a chapter index of 96 drugs and an index to chapters I-XCVI. Since at this time there was no natural grouping of plants, the descriptions and figures are arranged alphabetically. The herbs discussed were all to be found in Germany, and the object of the book was to show the reader their uses as medicinal remedies. The illustrations are woodcuts, so stiff and conventional sometimes as to be almost unrecognizable as plants. As in all the early herbals, the whole plant is depicted, even the root, probably because the roots were so often valuable as a medicine.

Agnes Arber, in her work on "Herbals," tells us that this herbal is sometimes "attributed to Arnold de Nova Villa, a physician of the thirteenth century, a mistake which arose through the conspicuous citation of his name in the preface

of the Venetian edition." The early book-binder was evidently under the same impression, for the back is labeled "Arnoldus de Villanova Herbarius." Now, however, the authorship is considered anonymous, although it is probably German. The book was first published in Mainz, being a compilation of the writings of certain medieval authors, classical and Arabian, and a forerunner of the "Ortus Sanitatis" and "Gart der Gesundheit."

Books of the fifteenth century were generally bound with heavy boards covered either with calf, vellum, pigskin, doeskin, sheep, or goatskin. The absence of boards in the binding of the Garden copy makes it difficult to say whether or not the binding is original, although it is certainly very old. The leather has worn thin, and at the edges is the thickness of paper. The threads used in sewing the binding have been brought through the backbone over two applied leather pieces.

After learning the craft from Gutenberg, Fust and Schöffer, etc., the printers scattered throughout Europe and eventually the various presses developed definite characteristics. The oldest book in the Garden library is from a Louvain press, a book on agriculture by Petrus de Crescentiis.

Crescentiis, Petrus de. Opus ruralium commodorum. Louvain 1474. — De Crescentiis was born in Bologna about the middle of the thirteenth century. Most of his life was spent in the city as a jurist, and it was not until his later years that he retired to the country and finished his "Opus Ruralium." He was a student of logic, medicine, and natural history from a scientific viewpoint and may be considered the founder of modern agriculture. Besides agriculture, his book presents sections on bee-keeping, hunting, falconry, dogs, horses, cattle, and the medicinal properties of plants. The Garden copy was published in Louvain at the press of Joannes de Westfalia in 1474. It still retains its original binding, which is very well preserved and interesting. The thick wooden boards, characteristic of the early binding, are covered with brown leather, probably calf, beautifully tooled in a diamond pattern set in a frame of five lines or "fillets."

Within the diamonds or "lozenges" are designs of the Maltese cross, the fleur-de-lis, the rampant lion, and the Paschal lamb. The remains of the metal clasps are still attached to the outside cover. On the inside fly-leaf a previous owner has written "Vendu chez La Valliere, en 1784—150 livres." The larger initials used throughout the book to designate a new chapter or paragraph are beautifully illumined with red which has kept its brilliancy through more than four and one-half centuries. The same red is used in the colophon, which states that the book was printed in the year 1474, "Decembris die nona."

Gart der Gesundheit. Augsburg, 1487.—One of the rarest of all incunabula herbals is "Gart der Gesundheit," published by Hannsen Schönsperger at Augsburg in 1487. Some authorities question the existence of the 1487 edition, but the Garden copy is undoubtedly of this date, and there is also supposed to be a copy at an eastern university. This work is usually referred to as the "smaller" or "German Hortus," and, like the "Herbarius Latinus," is a compilation, although the compiler's name has never been definitely settled. Some of the leaves in the Garden copy have been mixed in rebinding, but apparently the book is complete except for the lack of one leaf. A few of the leaves have been clopped very close, and a few have been bitten by insects. The colored title-page is crude but most interesting. It represents an apothecary's shop with five savants in the foreground (three with beards, two without). An apothecary's clerk at the back is mixing drugs in a mortar, and so poor is the perspective that he appears to be standing on the ear of the savant in the center. Along the wall, in the background, are shelves containing jars, boxes, and bottles, and the designs on some of the jars might prove interesting to a student of heraldry. An open window on the right wall looks out on a landscape of rolling country. The text consists of 435 chapters arranged alphabetically, each containing a description of some plant, animal, or mineral having a medicinal use. There are 392 colored woodcuts in the text, 366 of which are of plants. The colophon at the end of the book states that it was printed "an der mittwochen nach dem

weÿssen Suntag — anno M-CCCC—und in dem LXXXVII jare [March 7, 1487]. Some one with an artistic aspiration has drawn on the last page the head of a Greek and five later owners have made a hopeless attempt to copy it. On the same page is a Greek quotation, which freely translated reads: "An unlettered man is like a barren tree."

[*Macer Floridus*]. *De viribus herbar*[*um*] *ramosissimum medicus* [*et*] *medico*[*rum*] *speculum.* [*About 1490?*]. *Paris: Gui Marchand.*—The date of the Garden copy of "Macer Floridus" is unsettled, but most authorities agree that it was published before 1500. All the illustrated editions of this work are unsigned and undated, according to Klebs, but all are evidently from French presses about the end of the fifteenth century. Klebs states that eight different editions or variants can be distinguished, and that all "have a family resemblance, being small quartos with leaves (often missing) printed with the characteristic Burgundian Gothic type (dart-like s and f) early in vogue also in England and the Netherlands."

The work is a poem written in Latin hexameter, enumerating the herbs and their healing powers. Some authorities say that "Macer Floridus," or Aemilius Macer, was the pseudonym of a physician whose real name was Odo. Others claim that the name was chosen in honor of the Roman poet, Aemilius Macer, a friend of Virgil's. The Garden copy is evidently complete and in perfect condition. Klebs, in a note written in 1907 relating to our copy, makes the following statement: "I think I can identify your *Macer* copy. It corresponds to the copies in the Morgan library and in the surgeon-general's library, both of which, however, are imperfect. Yours seems to be the only perfect copy . . . (Yours is surely 15th C.). I have good reason to think that the edition of your copy is the oldest of the Paris series (and unique because complete)." The woodcut frontispiece in "Macer Floridus" in some editions is repeated up to three times; the Garden copy contains two reproductions which vary a trifle. It represents a monk at his desk writing in a large volume with a quill. In the frontispiece the monk's cap, the book on the desk, and the edges of the other books

are colored red, while the second cut, which is on the reverse side, has the title omitted and is uncolored. Klebs says there are 77 plants discussed and that the illustrations vary from 59 to 66. The Garden copy contains the maximum of illustrations. A list of the afflictions for which the plants are a remedy are given in the wide outer margin. The poem ends with the following quotation in Latin: "You who wish to learn the various powers of herbs take care that Macer is ever present; when he leads or with him leading you shall be learned."

Barbarus, Hermolaus. Castigationes Plinii. 1492, 1493.— One of the most interesting of our incunabula, from the standpoint of typography and binding, is Barbarus' "Castigationes Plinii," published by an unknown printer in Italy in 1492 and 1493. Barbarus, or Barbaro, was a Venetian scholar who edited and translated a number of classical works, the most important being the "Castigationes Plinii," in which he boasted of having made 5,000 corrections in Pliny's "Natural History." One of the earliest records of printers' copyrights was in 1493, when a privilege was granted Daniele Barbaro to a 10-year copyright in the work of his deceased brother, Hermolao, the "Castigationes Plinii." This is one of the few examples of early Italian printing in the Garden library, but authorities differ as to whether it is from a Venetian or Roman press. The preface of the 1492 part contains the following data: "Hermolai Barbari Patricii Veneti . . . P. Aquiliensis in Castigationes Plinianas. . . . Octavo Kalendas MCCCCXCII"; and the preface of the 1493 part: "Hermolai Barbari. . . . Roma idibus ianuariis MCCCCXCIII secunda editio Castigationum Plinianarum, . . ." The flyleaf bears an inscription in Latin, of which the following can be translated: "I, Hieronymus Emser, . . . do bequeath and give after my death to . . ." [remainder of script illegible]. The binding of the book is evidently original, of calf, and is stamped in a diamond pattern, within which are conventional designs. The leather is worn at the edges and contains some worm holes, but considering the binding is over 400 years old its condition is remarkably good.

E. M.

A NEW SCYTONEMA FOR MISSOURI

On October 9, 1932, the writer, accompanied by J. A. Steyermark, visited the region of Jam-Up Bluffs, on Jack's Fork of Current River, about eight miles northwest of Birch Tree, Shannon Co., Mo. Having botanized in the region of Jam-Up Cave we climbed a bluff which descended into a valley extending about one-fourth of a mile. We then came upon a sink occupying the entire width of the valley and into which runs the surface drainage from heavy rains. Under the north wall of the sink was an opening leading into a cave. We were able to explore the cave for about 100 feet, but then the roof became so low that further progress was prevented. An illustration of this natural tunnel may be seen in THE SCHOOL OF MINES AND METALLURGY OF THE UNIVERSITY OF MISSOURI, BULLETIN 7, pl. 7A, Nov., 1923.

A pool of water occupied the entire floor of the cave. *Potamogeton pulcher* Tuckerm., as well as numerous algae, were growing in the apparently semi-stagnant water. At the outer edge of the pool brownish cespitose masses of a blue-green alga were abundant, some of the colonies being completely submerged in the shallow water, others emergent to completely emerged. Material of this alga was collected and brought back to the Graduate Laboratories at the Garden for determination.

The alga proved to be *Scytonema alatum* (Carmichael) Borzi. It is easily recognized by the lamellose wings or membranous expansions of the sheaths. The trichomes were 10–14 mu in diameter; filaments 59–73 mu in diameter. This alga has not been reported from Missouri by any previous collector so far as is known.

WARD SHARP.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke in a symposium on "Timber" before the American Society for Testing Materials, at the Governor Clinton Hotel, New York, November 17.

Dr. C. W. Dodge, Mycologist to the Garden, gave an illustrated lecture before the biological society of Phi Sigma, December 20, on "Fungi Producing Ringworm."

Dr. Mildred E. Mathias, research associate, New York Botanical Garden, formerly research assistant at the Garden, spent some time in the Garden library recently, pursuing her work in connection with the Umbelliferae for the "North American Flora."

Attention is called to the winter course in gardening for amateurs previously announced in the November number of the BULLETIN. The course will be given on Tuesday afternoons at 3:45 from January 3 to March 28. Registration should be by letter, with check payable to the Missouri Botanical Garden, but fees will also be received on January 3 at the first lecture at 3 o'clock.

Recent visitors to the Garden include Mr. Francis Drouet, graduate assistant in botany, University of Missouri, Columbia, Mo.; Dr. Harry J. Fuller, instructor in botany, University of Illinois, Urbana, Ill.; Dr. Margaret B. Church, mycologist, Urbana University, Urbana, Ohio; Mr. C. E. Moore, professor of biology, State Teachers College, Memphis, Tenn.; Dr. Karel Hujer, formerly of Yerkes Observatory, Williams Bay, Wis., who is on his way to Yucatan to study Maya ruins.

STATISTICAL INFORMATION FOR NOVEMBER, 1932

GARDEN ATTENDANCE:

Total number of visitors.....51,031

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	46
Total number of books and pamphlets donated.....	149

PLANT ACCESSIONS:

Total number of plants and seed packets donated.....	15

PLANT DISTRIBUTION:

Number of charitable institutions to which plants distributed	22

HERBARIUM ACCESSIONS:

By Purchase—

Merrill, George M.—Plants of Arkansas.....	70
Weigel, Theo. Oswald—Behn, "Flora Chilensis," Nos. 1-100, inclusive	100
Weese, J., "Eumycetes selecti exsiccati," Lief. XXII, Nos. 526-550, inclusive.....	25
H. Zillig, "Ustilagineen Europas," Lief. I-XII, Nos. 1-120, inclusive	120

By Gift—

Darlington, Miss Josephine—Mentzelias of California..	19
Goodman, George J.—Plants of Utah and Wyoming....	86
Merrill, George M.—Plants of Arkansas.....	20
Moore, C. E.—Plants of Tennessee.....	120
Steyermark, Julian A.—Plants of Missouri.....	225

By Exchange—

California Academy of Sciences, by John Thomas Howell —*Grindelia* of California.....	15
Demaree, Professor Delzie—Plants of Arkansas.....	311
U. S. National Museum—Plants of Argentina, China, etc.	561

By Transfer—

Lodewyks, Miss Maude—*Sophora japonica* L., from horticulture	2
Total	1,674

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FLORAL DISPLAYS OF SPECIAL INTEREST IN 1932

In order that readers of the BULLETIN may have a more comprehensive idea of the various flower shows and outdoor exhibits which from month to month may be seen at the Garden, the following tentative schedule is given. While the indoor exhibits can be quite definitely indicated, the blooming period of outdoor plants is subject to variation, depending upon the weather, and out-of-town readers should confirm the date of any display before visiting the Garden.

JANUARY

(Floral Display House)
Orchids, Primroses, and Cyclamen.

FEBRUARY

(Floral Display House)
Orchids.

MARCH

(Floral Display House)
March 1–9—Orchids.
March 10–13—St. Louis Florists' Show.
March 14–31—Cinerarias and Azaleas.

APRIL

(Floral Display House)
Azaleas, Roses, Schizanthus.
(Outdoors)
Pansies, English Daisies, Early-flowering shrubs.

MAY

(Floral Display House)
Hybrid Pelargoniums, Salpiglossis, Begonias, Marguerites, Lupines, and other spring annuals.
May 20–22—St. Louis Horticultural Society Show.
(Outdoors)
Bulbs (early in month), Hardy Water-lilies, Peonies.
Iris (late in month), Spring-flowering shrubs and perennials.

JUNE

(Outdoors)
Roses, Hollyhocks. Medicinal Garden.

JULY

(Outdoors)
Tropical plants. Annuals. Economic Garden — farm crops, fiber plants, rice, cotton, peanuts, tobacco, sugar-cane. Medicinal Garden.

AUGUST

(Outdoors)
Tropical Water-lilies, Victoria Cruziana, Lotus Lilies. Economic Garden. Medicinal Garden.

SEPTEMBER

(Outdoors)
Tropical Water-lilies. Economic Garden. Medicinal Garden.

OCTOBER

(Floral Display House)
Dahlias (novelties and newer varieties).

NOVEMBER

(Floral Display House)
Chrysanthemum Show.

DECEMBER

(Floral Display House)
Poinsettias, Stevias.

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines. The Garden may also be reached by Bus Route No. 12, to which all other motor-bus lines transfer.

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